Julian

Anesthesia Workstation

Operating Instructions
Software 3.n

XXXX

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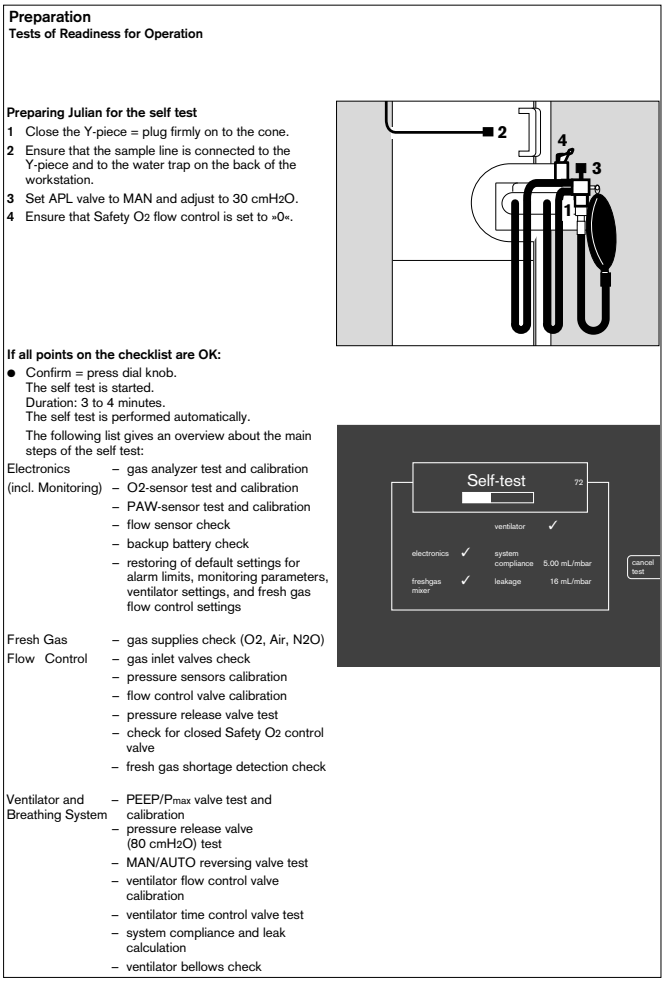
Working with these Operating Instructions

Header line – the title...
of the main chapter
The title of the respective sub-section is printed underneath the main header – to help you find your way quickly from subject to subject.

Page body...
the Operating Instructions
combine text and illustrations. The information is presented in the form of required steps of action, giving the user hands-on experience in learning how to use the anesthesia workstation.

Left-hand column...
the text
provides explanations and instructs users step-by-step in the practical use of the product, with short, clear instructions in easy to follow sequences.
Bullet points indicate separate actions. Where several actions are described, numbers are used to refer both to relevant details in the illustrations and to specify the sequence of actions.

Right-hand column...
the illustrations
provide the visual reference for the text and make it easier to locate the various parts of the equipment. Elements mentioned in the text are highlighted. Unnecessary details are omitted.
Rendering of screen displays guide the user and allow to reconfirm actions performed.


Preparation
Tests of Readiness for Operation
Preparing Julian for the self test
1 Close the Y-piece = plug firmly on to the cone.
2 Ensure that the sample line is connected to the Y-piece and to the water trap on the back of the workstation.
3 Set APL valve to MAN and adjust to 30 cmH2O.
4 Ensure that Safety O2 flow control is set to »0«.
2
4
3
1
If all points on the checklist are OK:
● Confirm = press dial knob.
The self test is started.
Duration: 3 to 4 minutes.
The self test is performed automatically.
The following list gives an overview about the main steps of the self test:
Electronics – gas analyzer test and calibration
(incl. Monitoring) – O2-sensor test and calibration
– PAW-sensor test and calibration
– flow sensor check
– backup battery check
– restoring of default settings for alarm limits, monitoring parameters, ventilator settings, and fresh gas flow control settings
Fresh Gas – gas supplies check (O2, Air, N2O)
Flow Control – gas inlet valves check
– pressure sensors calibration
– flow control valve calibration
– pressure release valve test
– check for closed Safety O2 control valve
– fresh gas shortage detection check
Ventilator and Breathing System – PEEP/Pmax valve test and calibration
– pressure release valve (80 cmH2O) test
– MAN/AUTO reversing valve test
– ventilator flow control valve calibration
– ventilator time control valve test
– system compliance and leak calculation
– ventilator bellows check
Self-test
ventilator ✓
electronics ✓
system compliance 5.00 mL/mbar
freshgas mixer ✓
leakage 16 mL/mbar
cancel test

WARNING !

Strictly follow this Operator's Instruction Manual

Any use of the product requires full understanding and strict observation of all portions of these instructions. The equipment is only to be used for the purpose specified under "Intended Use" (see page 18) and in conjunction with appropriate patient monitoring.
Observe all WARNINGS and CAUTIONS as rendered throughout this manual and on labels on the equipment.

NOTE: If you wish to read these instructions without the Julian Anesthesia Workstation in front of you, you may want to keep the full page photo folded out.

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Important Safety Information

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Operator's Responsibility for Patient Safety

For correct and effective use of the product and in order to avoid hazards, it is mandatory to carefully read and to observe all portions of this manual.

The design of the equipment, the accompanying literature, and the labeling on the equipment take into consideration that the purchase and use of the equipment are restricted to trained professionals, and that certain inherent characteristics of the equipment are known to the trained operator. Instructions, warnings, and caution statements are limited, therefore, largely to the specifics of the Dräger design. This publication excludes references to various hazards which are obvious to a medical professional and operator of this equipment, to the consequences of product misuse, and to potentially adverse effects in patients with abnormal conditions. Product modification or misuse can be dangerous. Dräger disclaims all liability for the consequences of product alterations or modifications, as well as for the consequences which might result from the combination of this product with other products whether supplied by Dräger or by other manufacturers if such a combination is not endorsed by Dräger.

The operators of the anesthesia system must recognize their responsibility for choosing appropriate safety monitoring that supplies adequate information on equipment performance and patient condition. Patient safety may be achieved through a wide variety of different means ranging from electronic surveillance of equipment performance and patient condition to simple, direct observation of clinical signs. The responsibility for the selection of the best level of patient monitoring lies solely with the equipment operator.

Limitation of Liability

Dräger's liability, whether arising out of or related to manufacture and sale of the goods, their installation, demonstration, sales representation, use, performance, or otherwise, including any liability based upon Dräger's Product Warranty, is subject to and limited to the exclusive terms and conditions as set forth, whether based upon breach of warranty or any other cause of action whatsoever, regardless of any fault attributable to Dräger and regardless of the form of action (including, without limitation, breach of warranty, negligence, strict liability, or otherwise).

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All Dräger products are guaranteed to be free of defects for a period of one year from date of delivery.
The following are exceptions to this warranty:

1. The defect shall be a result of workmanship or material. Defects caused by misuse, mishandling, tampering, or by modifications not authorized by Dräger or its representatives are not covered.
2. Rubber and plastic components and materials are warranted to be free of defects at time of delivery.
3. Oxygen sensor capsules have a six-month limited warranty from the date of delivery.

Any product which proves to be defective in workmanship or material will be replaced, credited, or repaired with Dräger holding the option. Dräger is not responsible for deterioration, wear, or abuse. In any case, Dräger will not be liable beyond the original selling price.

Application of this warranty is subject to the following conditions:

1. Dräger or its authorized representative must be promptly notified, in writing, upon detection of the defective material or equipment.
2. Material out of specification must be returned, shipping prepaid, to Dräger or its authorized representative.
3. Examination by Dräger or its authorized representative must confirm that the defect is covered by the terms of this warranty.
4. Notification in writing, of defective material or equipment must be received by Dräger or its authorized representative no later than two (2) weeks following expiration of this warranty.

In order to assure complete protection under this warranty, the Customer Registration Card and/or Periodic Manufacturer's Service Record (if applicable) must be returned to Dräger within ten (10) days of receipt of the equipment.

The above is the sole warranty provided by Dräger. No other warranty expressed or implied is intended. Representatives of Dräger are not authorized to modify the terms of this warranty.

Dräger Medical, Inc., Telford, PA

Definitions

Abbreviations

Abbreviation	Meaning
AGas	Anesthetic agent
AGS	**A**nesthesia **G**as **S**cavenging System
AIR	Compressed air for medical use
APL	**A**djustable **P**ressure **L**imitation
BTPS	Measuring condition at **b**ody **t**emperature, current atmospheric **p**ressure and **s**aturated gas
CE 0123	Conformité Européenne Julian conforms to the respective EC requirements
C-Lock	The SpO_2 signal is synchronized with the ECG signal
CMV	Controlled Mandatory Ventilation
Compl.	Compliance
Des.	Desflurane
$EtCO_2$	End--tidal CO_2 concentration
Enf.	Enflurane
Fet	End-expiratory fraction
Fi	Inspiratory fraction
Fi Des	Inspiratory desflurane concentration
Fi Enf	Inspiratory enflurane concentration
Fi Hal	Inspiratory halothane concentration
Fi Iso	Inspiratory isoflurane concentration
Fi Sev	Inspiratory sevoflurane concentration
FLOW	Expiratory flow
Fi O_2	Inspiratory O_2 concentration
Hal.	Halothane
HLM	Alarm mode for Heart-Lung Machine
INOP	Function failure (inoperable)
Iso.	Isoflurane

Abbreviation	Meaning
MAC	Minimum Alveolar Concentration
MAN/SPONT	Manual ventilation / spontaneous breathing
MEAN	Mean (airway) pressure
MEDIBUS	Dräger communications protocol for medical equipment
MV	(Expiratory) minute volume
N_2O	Nitrous oxide (laughing gas)
NiBP	Non-invasive blood pressure
O_2	Oxygen
PAW	Airway pressure
PCV	Pressure Controlled Ventilation
PEAK	Peak (airway) pressure
PEEP	Positive end-expiratory pressure
PLAT	Plateau pressure
PLS	Pulse rate
Pmax	Maximum (airway) pressure setting
Safety O_2	Safety O_2 control valve
Sev.	Sevoflurane
SpO_2	Functional O_2 saturation
T_I:T_E	Ratio of inspiratory to expiratory time
Tip:Ti	Ratio of inspiratory pause time to inspiratory time
UPS	Uninterruptible power supply
VAC	Vacuum (e.g. for secretion aspiration)
V_T	Tidal volume

Symbols

Symbol	Meaning
	Suppress alarm tone for 2 minutes
	Call up standard screen + escape
	Call up basic screens in succession
	Standby / operation switch
	Dial knob for adjusting and confirming settings
	Fresh gas flowing
	Action in progress
✓	Action has been completed successfully
?	Repeat calibration
	Upper and lower alarm limits
	Upper alarm limit only
	Lower alarm limit only
	Alarm limit disabled
– –	Alarm limit deactivated
	Alarm disabled
* * * *	Enter 4-digit password
!	Advisory message
!!	Caution message
!!!	Warning message
	Protection class type B
	Protection class type BF
	Connection for equipotential bonding
	Refer to important information in Operating Instructions
	Close menu, back to previous menu
XX %	Available operating capacity of UPS

Definitions of Terms

WARNING !

A WARNING statement refers to conditions with a possibility of personal injury if disregarded.

CAUTION !

A CAUTION statement designates the possibility of damage to equipment if disregarded.

NOTE: A NOTE provides additional information intended to avoid inconveniences during operation.

Inspection	=	examination of actual condition
Service	=	measures to maintain specified condition
Repair	=	measures to restore specified condition
Maintenance	=	inspection, service, and repair, where necessary
Preventive Maintenance	=	Maintenance measures at regular intervals

Typing Conventions

Controls (knobs, hard keys and menu keys) are designated as »**Control Name**«, e.g.:

»**PCV**«

On-screen messages are printed in **bold**, e.g.:

BATTERY LOW !!!

Summary of WARNINGS and CAUTIONS

General Precautions

WARNING !

Strictly follow this Operator's Instruction Manual

Any use of the product requires full understanding and strict observation of all portions of these instructions. The equipment is only to be used for the purpose specified under "Intended Use" (see page 18) and in conjunction with appropriate patient monitoring.
Observe all WARNINGS and CAUTIONS as rendered throughout this manual and on labels on the equipment.

WARNING !

Do not use accessories with the Julian Anesthesia Workstation that are not listed in the component overview document enclosed with the device.

WARNING !

Safe connection with other electrical equipment:

Electrical connections to equipment which is not listed in these Instructions for Use should only be made following consultations with the respective manufacturers or a qualified and authorized professional.

WARNING !

To maintain grounding integrity, connect only to a "hospital grade" receptacle. Always disconnect supply before servicing.

WARNING !

DANGER, risk of explosion if used in the presence of flammable anesthetics.

This device is neither approved nor certified for use with combustible or explosive anesthetics (e.g. ether or cyclopropane).

WARNING !

Do not use wireless or cellular phones within 33 feet (10 m) of the equipment.

Radio communication devices may cause malfunction in electromedical equipment.

WARNING !

Do not use in conjunction with nuclear spin tomography (MRT, NMR, or NMI)!

Equipment malfunction may result.

WARNING !

The Julian Anesthesia Workstation may only be used under the supervision of qualified medical personnel in order to provide immediate corrective action in case of a malfunction.

WARNING !

In case of malfunction of any of the built-in monitoring, a substitute must be provided in order to maintain an adequate level of monitoring. The operator of the anesthesia system must still assume full responsibility for proper ventilation and patient safety in all situations.

WARNING !

Never operate the anesthesia workstation if it has suffered physical damage or does not seem to operate properly. In this case always refer servicing to properly trained and factory authorized service personnel.

CAUTION !

Restriction of Distribution

Federal Law and Regulations in the United States and Canada restrict this device to sale by or on the order of a physician.

Precautions During Preparation

WARNING !

Devices connected to the auxiliary outlets will not be powered by the uninterruptible power supply in the event of a power failure.

WARNING !

Always install parts that have been cleaned and disinfected!

WARNING !

Do not use antistatic or conductive breathing circuits!
They present a risk of burn injuries when used in combination with HF electrosurgery.

WARNING !

Only use original gas sample line. Other lines may change the technical data of the device.

WARNING !

When using a suction system, it is the responsibility of the user to ensure compliance with all regulations governing the handling and disposal of articles contaminated with body fluids (infectious waste).

WARNING !

Only use Dräger Vapor® 19.3 or Vapor 2000 with Julian Anesthesia System.

WARNING !

Ensure gas-disposal-assembly tubing is not pinched, kinked, or blocked in any manner.

WARNING !

Always use medical grade gases that are dry and free from dust and oil. Contaminated gas may cause system malfunction.

WARNING !

Each time you connect a machine to a wall or ceiling gas outlet carefully check hoses to ensure that both ends of the hose are indexed for the same gas. Pipeline delivery hoses used between wall outlets and anesthesia machines have caused accidents when, during assembly, an oxygen fitting was placed on one end of the hose and a nitrous oxide fitting on the other end.

WARNING !

- Always use extreme caution when handling O_2 cylinders!
- Oxygen intensely supports any burning! No smoking, no open fire in areas where oxygen is in use!
- Always secure O_2 cylinders against tipping!
- Do not expose O_2 cylinders to extreme heat!
- Do not use oil or grease on O_2 equipment such as tank valves or pressure regulators. Do not touch with oily hands. Risk of explosion!
- Open and close valves slowly, with smooth turns. Do not use any tools.
- If a cylinder valve is leaky or difficult to operate, it must be repaired by an authorized professional.

WARNING !

Restrictions for use of auxiliary power outlets

- Do not connect HF surgical devices to the auxiliary outlets!
- Connecting equipment to the auxiliary outlets may cause the patient leakage current to rise above the permitted values in the event of failure of a protective ground conductor. In such cases, the risk of electric shock cannot be excluded.
- Additional power strips must not be connected to the auxiliary outlets.

WARNING !

To maintain grounding integrity, connect only to a "hospital grade" receptacle. Always disconnect supply before servicing.

Summary of WARNINGS and CAUTIONS

Precautions During Preparation
Precautions During Operation
Monitoring Precautions
Precautions During Care

WARNING !

Devices mounted on extended arms on the left or right side of the machine can cause tip over.

CAUTION !

Do not use anesthetic gas scavenging sytem in combination with extracorporal oxygenator.

Precautions During Operation

WARNING !

Always use an anesthesia system that has been cleaned and disinfected and has been successfully tested to be ready for operation.

WARNING !

Always follow accepted hospital procedures for handling body fluids.

WARNING !

Absorbent is caustic and is a strong irritant to the eyes, skin, and respiratory tract. When emptying or filling absorber, take care not to spill its contents.

WARNING !

Do not perform leak test while a patient is connected to the anesthesia workstation.

WARNING !

Devices connected to the auxiliary outlets will not be powered by the uninterruptible power supply in the event of a power failure.

WARNING !

Manual ventilation is not possible when Julian is in standby mode!

Monitoring Precautions

WARNING !

Warning or Caution level audible alarms require immediate operator attention to avert or to prevent development of situations with the possibility of patient injury.

WARNING !

The alarm silence button is intended to provide a way of muting audible alarms while corrective action is taken. Failure to identify and correct alarm situations may result in patient injury.

WARNING !

Always set audible alarm volume to a level that is sufficiently loud with respect to the general noise level of the surroundings.

WARNING !

The operator is responsible for manual selection of the anesthetic agent and for correct filling of the anesthetic vaporizer!

WARNING !

Use only original Nellcor SpO_2 sensors.

Follow Instructions for Use of the sensors – incorrect positioning or use can cause tissue damage.

Precautions During Care

WARNING !

Always follow accepted hospital procedures for handling equipment contaminated with body fluids.

WARNING !

Absorbent is caustic and is a strong irritant to the eyes, skin, and respiratory tract. When emptying absorber, take care not to spill its contents.

WARNING !

Follow all accepted hospital procedures for disinfecting parts contaminated with body fluids (protective clothing, eyewear, etc.).

WARNING !

Follow all accepted hospital procedures for processing and disposing of infectious waste.

WARNING !

Absorbent is caustic and is a strong irritant to the eyes, skin, and respiratory tract. When filling absorber, take care not to spill its contents.

CAUTION !

When removing and connecting breathing circuits, always hold by the connector cuff and not by the spiral reinforcement, otherwise the reinforcing spiral may be torn off the cuff.
Breathing hoses with damaged spirals can easily be kinked and may interrupt ventilation!
Always check the breathing hoses for damage prior to use.
Damaged breathing circuits must not be used.

CAUTION !

Do not process flow sensor in cleaning and disinfection equipment or steam-autoclave flow sensor.

Do not use compressed air, a brush or similar tools to clean flow sensor as this could possibly damage the thin wires inside.

CAUTION !

Do not treat exterior surfaces of the workstation with disinfecting agents containing alcohol.

CAUTION !

Do not clean filter in cleaning and disinfecting equipment.
Do not immerse filter in disinfectant solution!

Precautions During Maintenance

WARNING !

To avoid any risk of infection, clean and disinfect ventilator and accessories before any maintenance according to established hospital procedures - this applies also when returning devices or parts for repair.

WARNING !

Preventive Maintenance work on the Julian Anesthesia Workstation shall be performed by DrägerService or by an authorized representative of DrägerService only.

WARNING !

Disconnect power!

Before opening the unit, always disconnect plug at the wall outlet first.

WARNING !

Treatment of batteries and O_2-sensor capsules:

Do not throw into fire! Risk of explosion.

Do not force open! Danger of bodily injury.

Follow all local, state, and federal regulations with respect to environmental protection when disposing of batteries and O_2-sensor capsules.

CAUTION !

In case of malfunction of this device, contact your DrägerService or an authorized representative of DrägerService.

The device must be inspected and serviced (preventive maintenance) by DrägerService or an authorized representative of DrägerService at regular 6 month intervals. We recommend obtaining a service contract through your vendor.

Maintenance or repair of the Julian Anesthesia Workstation shall be performed by DrägerService or an authorized representative of DrägerService.

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Intended Use

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Intended Medical Application

The Julian is indicated as a continuous flow anesthesia system. The Julian may be used for manually assisted, or automatic ventilation, and delivery of gases, anesthetic vapor, and monitoring of oxygen concentration, breathing pressure, and respiratory volume.

Federal law restrics this device to sale by or on the order of a physician.

WARNING !

Do not use accessories with the Julian Anesthesia Workstation that are not listed in the component overview document enclosed with the device.

WARNING !

To maintain grounding integrity, connect only to a "hospital grade" receptacle. Always disconnect supply before servicing.

WARNING !

DANGER, risk of explosion if used in the presence of flammable anesthetics.

This device is neither approved nor certified for use with combustible or explosive anesthetics (e.g. ether or cyclopropane).

WARNING !

Do not use wireless or cellular phones within 33 feet (10 m) of the equipment.

Radio communication devices may cause malfunction in electromedical equipment.

WARNING !

Do not use in conjunction with nuclear spin tomography (MRT, NMR, or NMI)!

Equipment malfunction may result.

WARNING !

The Julian Anesthesia Workstation may only be used under the supervision of qualified medical personnel in order to provide immediate corrective action in case of a malfunction.

Anesthesia supported:

– Inhalation anesthesia in semi-closed to virtually closed systems with "low flow" and "minimal flow" techniques (for minimal gas and anesthetic agent consumption) with a fresh gas flow of 0.5 to 12 L/min.

Ventilation Modes and Monitoring

Ventilation options:

– Automatic continuous mandatory ventilation (CMV) and pressure-controlled ventilation (PCV)

– Manual ventilation (MAN)

– Spontaneous ventilation (SPONT)

The following measured values can be displayed:

– Peak pressure, mean pressure, plateau pressure and PEEP

– Expiratory minute volume
Tidal volume V_T
Breathing rate
Patient compliance

– Inspiratory and expiratory concentration of O_2, N_2O, anesthetic agent and CO_2

available options:

– Functional oxygen saturation (SpO_2) and pulse rate

– Airway temperature

The following parameters can be displayed as waveforms:

– Airway pressure

– Expiratory flow

– Inspiratory and expiratory concentration of O_2, CO_2 and anesthetic agent

available option:

– Functional oxygen saturation (plethysmogram)

Graphical and numerical trends are also available.

Monitoring
is provided by adjustable alarm limits that can be adapted to the ventilation mode.

Operating Concept

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Design of the User Interface

All settings required for

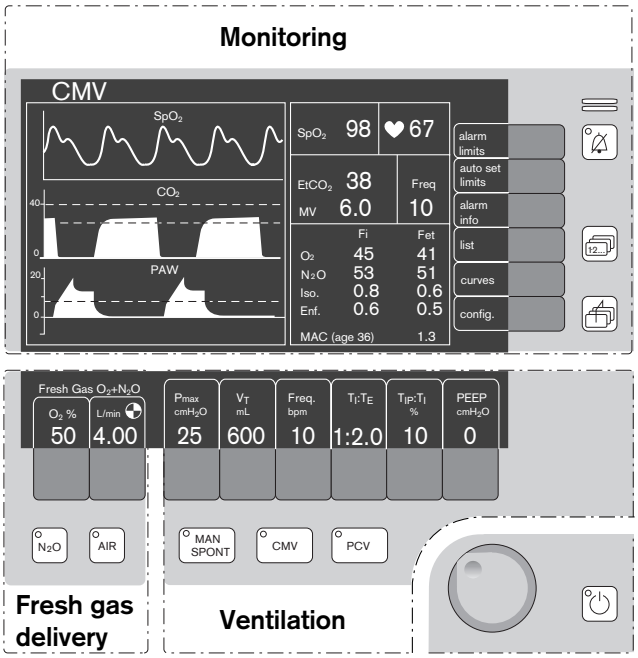
- Fresh gas delivery
- Ventilation
- Monitoring

are entered on the system screen using the respective keys and the central dial knob.
Keys are grouped in fields according to function:

Left-hand field
Fresh gas delivery

Right-hand field
Ventilation

Center field
Monitoring



The main functions for anesthesia, e.g. selection of N_2O or AIR, or selection of ventilation modes, can be accessed directly by keys with permanently defined functions ("hard" keys):

1 Left-hand block

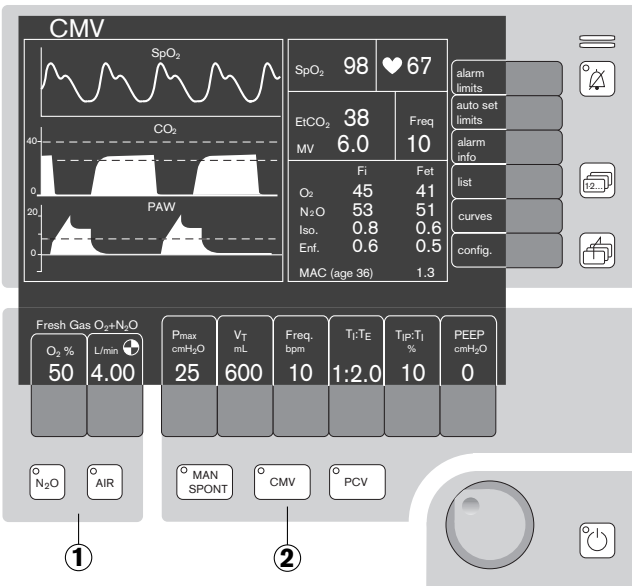
»**N_2O**« or »**AIR**« keys are used to select the gas to be mixed with O_2 for the fresh gas mixture.

2 Right-hand block

»**MAN SPONT**«, »**CMV**« or »**PCV**« keys select the ventilation mode.

These function keys are located in the bottom row on the control panel.

Left-hand block for fresh gas settings
Right-hand block for ventilation settings



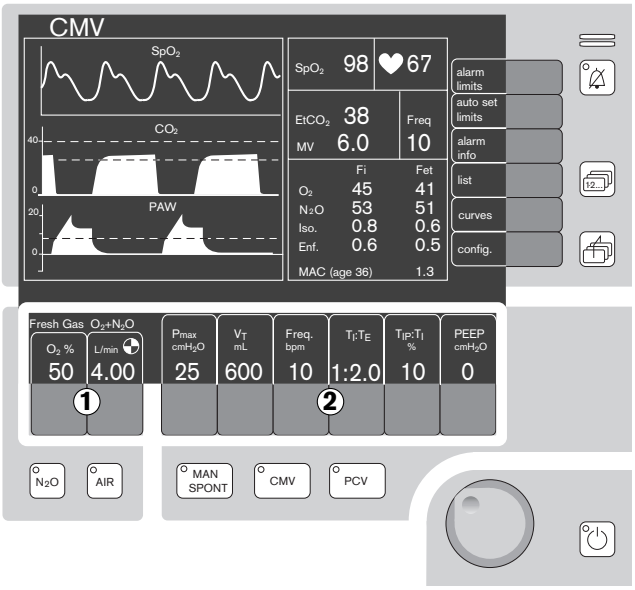
Complementary "menu" keys with variable functions are provided at the bottom edge of the screen, above each group of "hard" keys. These menu keys are used to set fresh gas delivery and ventilation parameters.

1 Left-hand block:
Keys for setting the O_2 concentration and fresh gas flow.

2 Right-hand block:
Keys for setting parameters for the respective ventilation mode. The example shows parameters for controlled, mandatory ventilation (CMV).

These menu keys have different functions, depending on operating status or ventilation mode.

Current parameter values are displayed in the menu key field.



In a prominent position at the bottom right-hand side:

The "turn-and-push" dial knob serves as the main control element of the system and has the following functions in all setting operations:

3 select = turn

4 confirm = press

– to confirm the selected carrier gas or a ventilation mode,

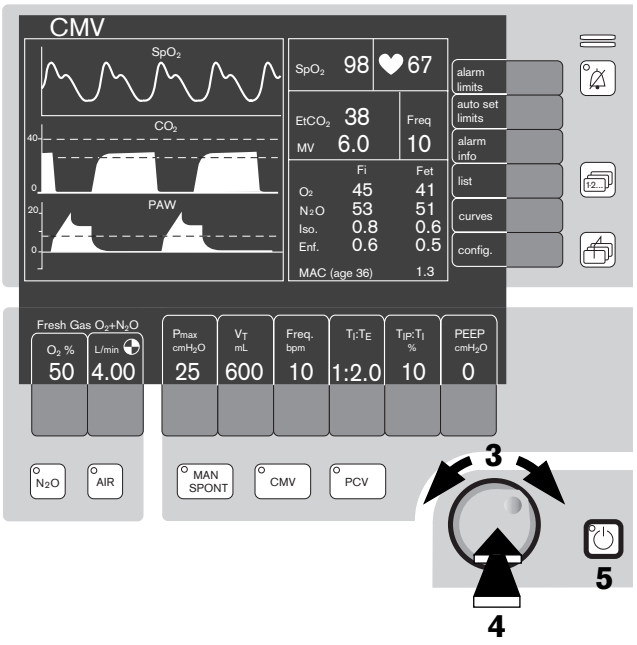
– to set and confirm parameters for fresh gas and ventilation modes,

– to set and confirm monitoring functions.

Next to the dial knob:

The ⏻ key for switching to standby mode.

5 Press ⏻ and confirm by pressing dial knob.



Screen Menus

Screen Layout

① Status field:
For information on the current operating mode

② Graphics field:
For waveform and trend traces as well as bar graphs

③ Alarm field:
For information on alarms (warnings, etc.)
and their priority

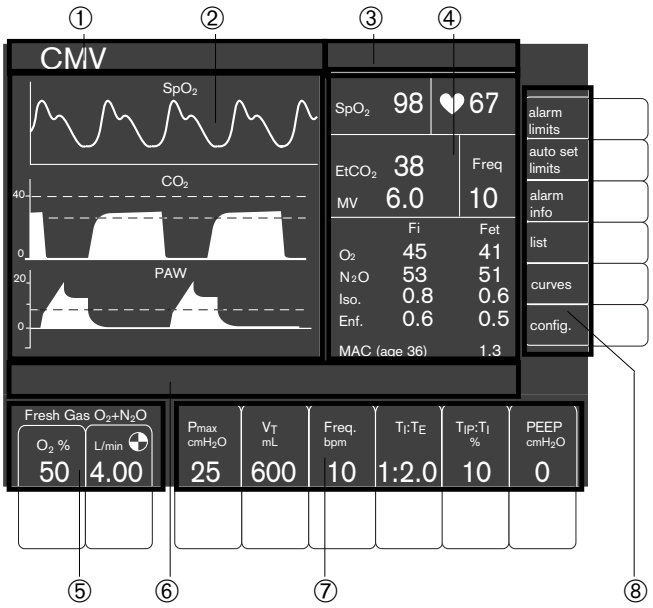
④ Numerical value field:
For numerical values

⑤ Lower menu keys – for fresh gas parameters

⑥ Prompt field:
For user guidance

⑦ Lower menu keys – for ventilation parameters

⑧ Right-hand menu keys – for monitoring:
For quick selection of desired monitoring function



Ventilation Menus

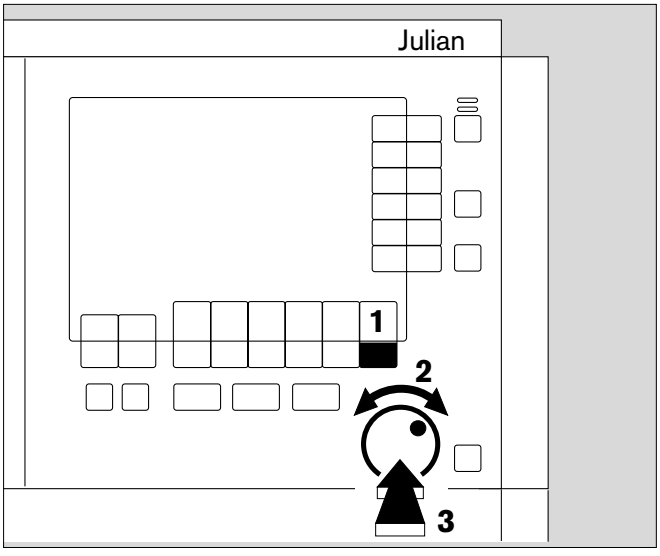
Selecting / setting ventilation parameters

Example: PEEP ventilation parameter

1 Press »**PEEP**« menu key.

2 Select PEEP value = turn dial knob.

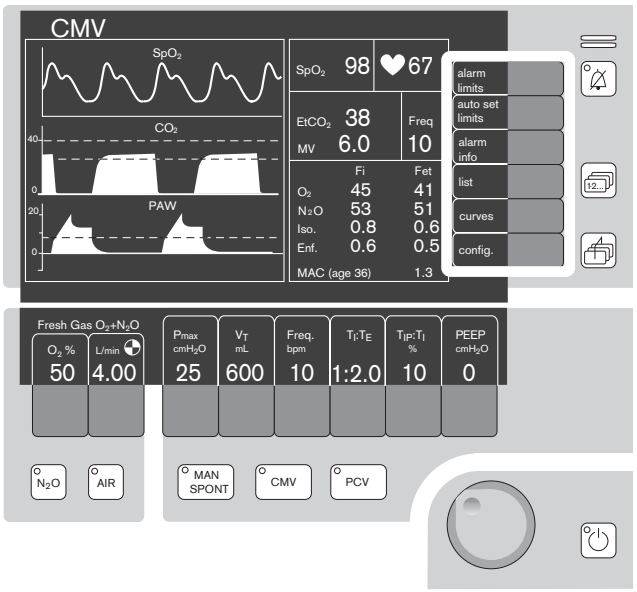
3 Confirm the PEEP value = press the dial knob.



Monitoring Menus

The menu keys for the various monitoring functions are located on the right-hand side of the screen.

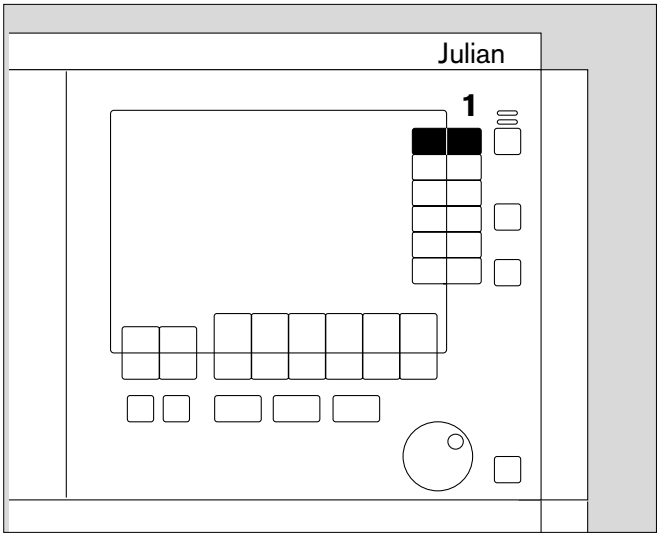
These keys may have different functions (menu keys), depending on the monitoring screen displayed.

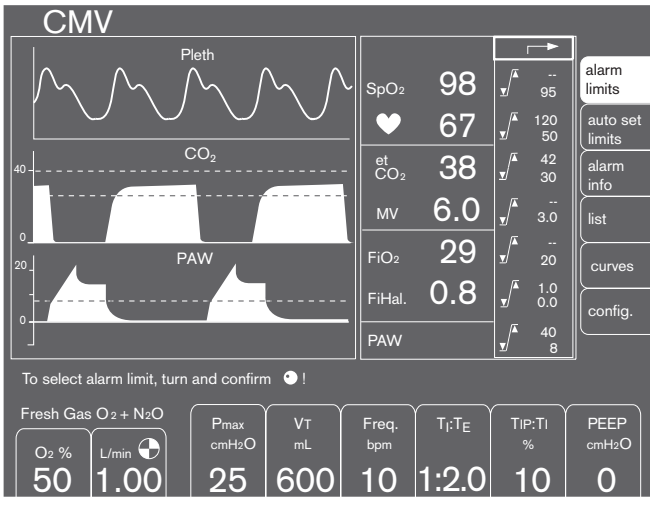


Selecting / setting monitoring functions

For example, to change the lower alarm limit of the end-tidal CO_2 concentration.

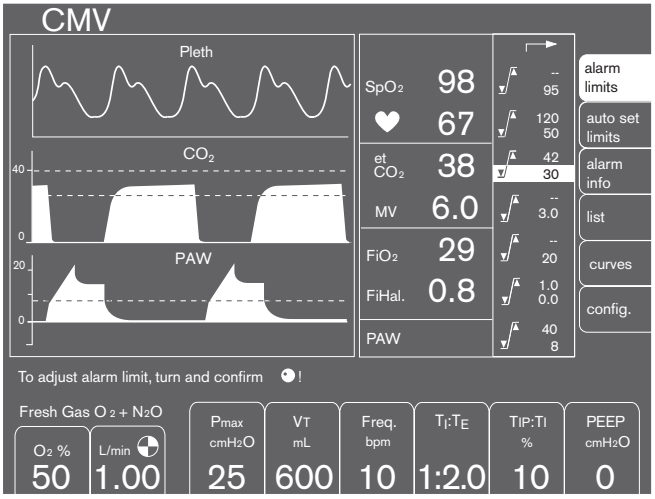
1 Press »**alarm limits**« menu key. The **alarm limits** menu will be displayed on the screen.





- Select alarm limit value = turn dial knob.
  Confirm the selection = press the dial knob.

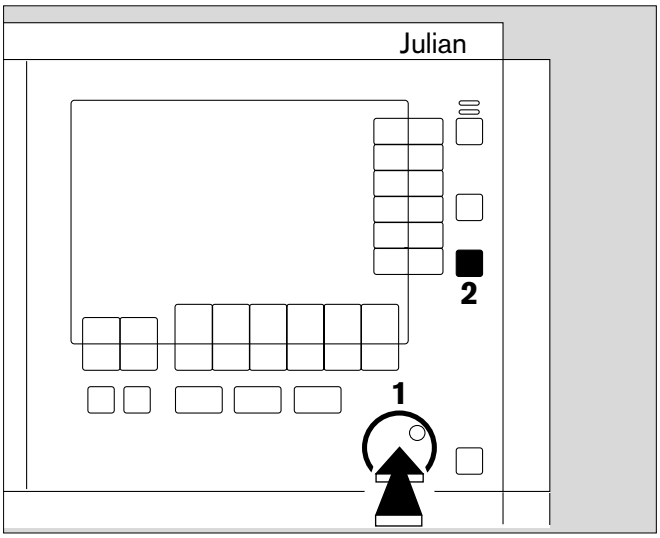
  The limit value is highlighted.
  Example: lower alarm limit etCO2: ↓ 30
- Set alarm limit value = turn dial knob.
- Confirm new alarm limit = press dial knob.
  The cursor returns to the ↦ symbol.



To exit the **alarm limits** menu:

1 Press the dial knob
or

2 Press the key.



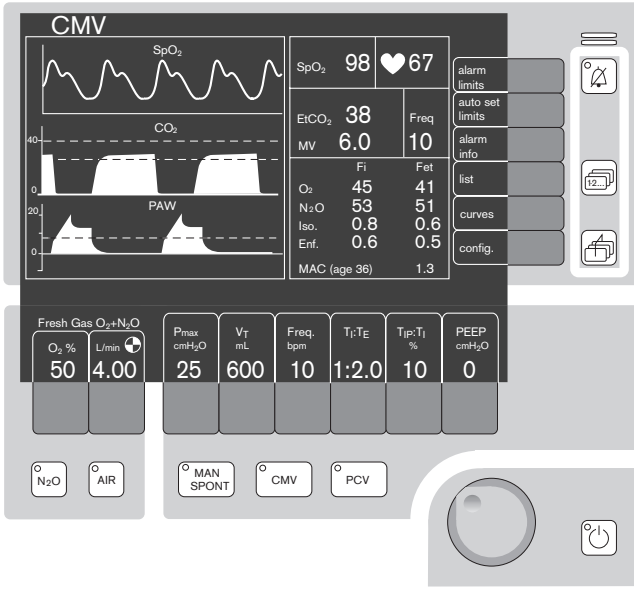
The function keys for standard functions are located on the right-hand side of the control panel.

Suppress audible alarms for 2 minutes.

Select a screen page (see page 25).

Back to standard page.

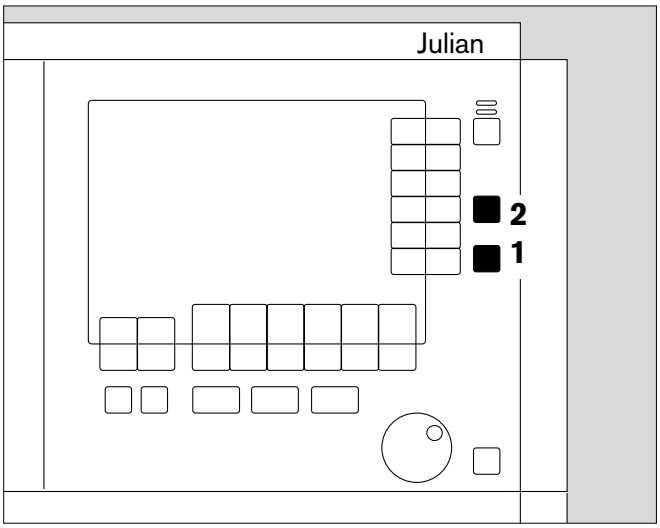
This key is also used to cancel any menu or parameter settings before modifications are confirmed.



Three Basic Screens for Monitoring

To call up the **standard screen, data screen** and **trend screen** in succession:

1 Briefly press the key until the desired screen is displayed.

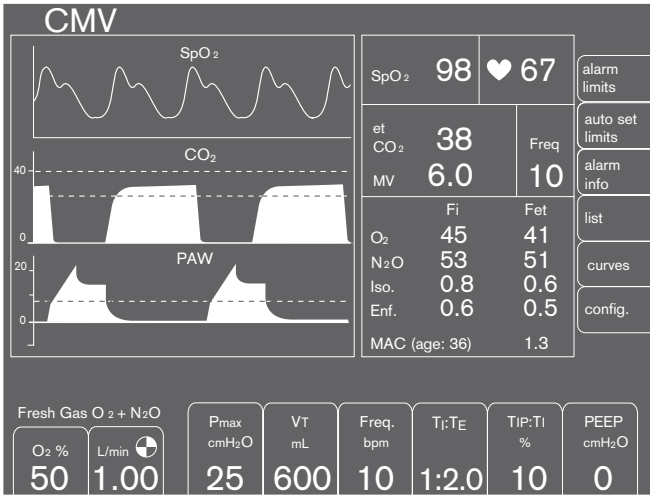


Back to the standard screen:

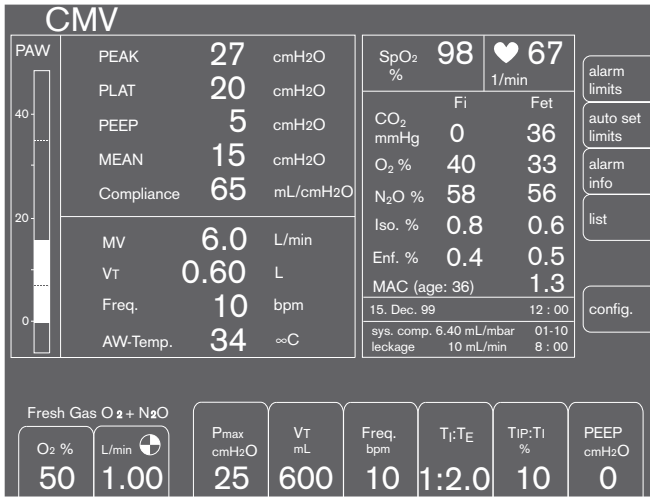
2 Press the key.

The fresh gas and ventilation parameters can be set with menu keys in each of the three basic screens.

The standard screen
with three selectable waveform traces.
The most important numerical values are displayed in groups on the right-hand side of the screen.



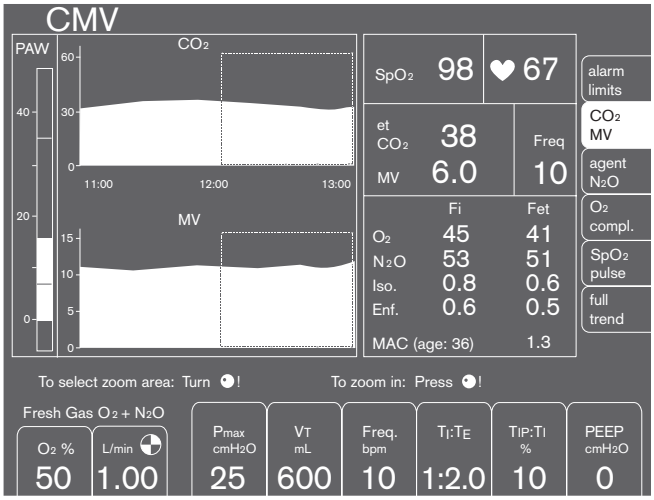
The data screen
contains all numerical values with their units of measurement.



The trend screen
displays recorded progress of numerical values over time since measurement started. The current measured values are displayed on the right-hand side.

Display (example):

Trends for CO_2 and minute volume MV.



Preparation

Contents

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Charging the Battery for Emergency Operation.....28

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Preparing the Suction System..... 30
Preparing Gas Disposal Systems.....31

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Gas Connections..... 33
Anesthetic Gas Scavenging System..... 35
Electrical Connections.....36

Checks of Readiness for Operation.....37
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Emergency Startup..... 44

Before Using for the First Time

Install enclosed O2-sensor, page 119.
Install flow sensor, page 116.

Charging the Battery for Emergency Operation

Julian has a built-in uninterruptible power supply (UPS) which maintains power for at least 30 minutes in the event of a power failure, provided that the battery is fully charged.
The switchover to the battery-powered UPS is automatic and is indicated on the screen by the message:

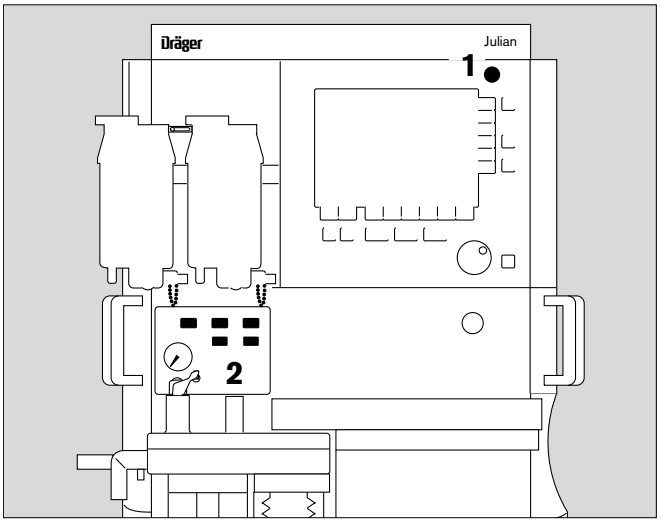
POWER FAIL!

Recharging of the battery becomes necessary after approximately 2 weeks of non-use

The battery recharges automatically when the workstation is connected to line power,

We therefore suggest to leave Julian connected to line power during extended periods of non-use.

The battery must be charged for 10 hours before using for the first time.



- Connect power plug of the Julian workstation to a live wall outlet. The line voltage must correspond to the voltage specified on the rating plate.

1 The green LED ⊣D⊢ lights up.

2 The displays for pipeline pressure and cylinder pressure light up.

- Leave Julian connected to line power for 10 hours. The system does not have to be switched on.

WARNING !

Devices connected to the auxiliary outlets will not be powered by the uninterruptible power supply in the event of a power failure.

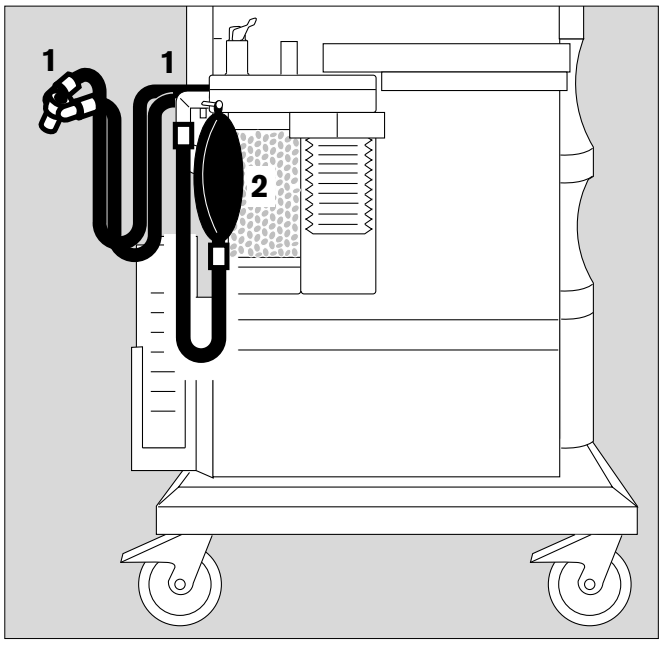
Assembly of Components

WARNING !

Always install parts that have been cleaned and disinfected!

For assembly and installation of the breathing system, bellows, and absorber system, please refer to page 117, "Assembly".

Installing the Breathing Circuit



1 Connect the limbs of the breathing hoses to the Y-piece and to the ports of the breathing system.

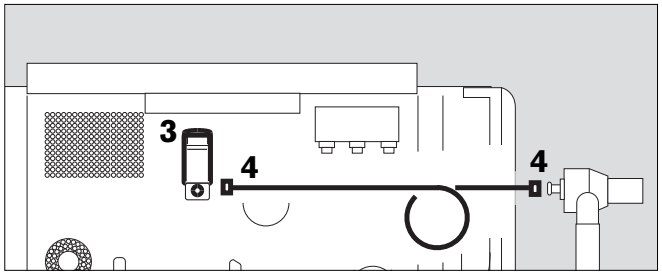
2 Connect the 2.3 L breathing bag to the breathing hose with a connecting sleeve. Plug the breathing hose onto the angled connector and hang the breathing bag on the hook.

WARNING !

Do not use antistatic or conductive patient breathing hoses!
They present a risk of burn injuries when used in combination with HF electrosurgery.

3 Fit water trap into its holder.

4 Screw the sample line onto the Y-piece and water trap.



WARNING !

Only use original gas sample line. Other lines may change the technical data of the device.

Preparing the Suction System

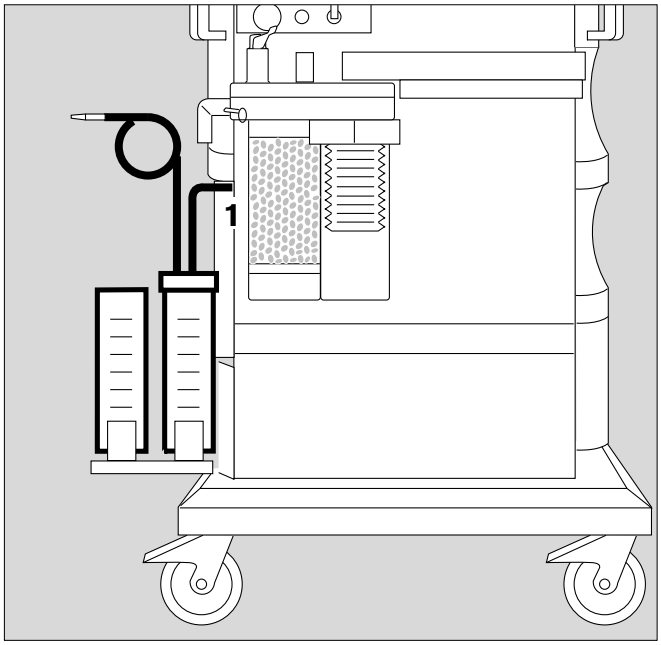
The Julian Anesthesia Workstation is designed to accept commonly used, vacuum driven suction systems such as Abbott Receptal® or similar units.

WARNING !

When using a suction system, it is the responsibility of the user to ensure compliance with all regulations governing the handling and disposal of articles contaminated with body fluids (infectious waste).

- Prepare secretion collecting canisters and hose system according to manufacturer's instructions for use for the suction unit.

1 Attach vacuum hose to the VAC port of the Julian Workstation.

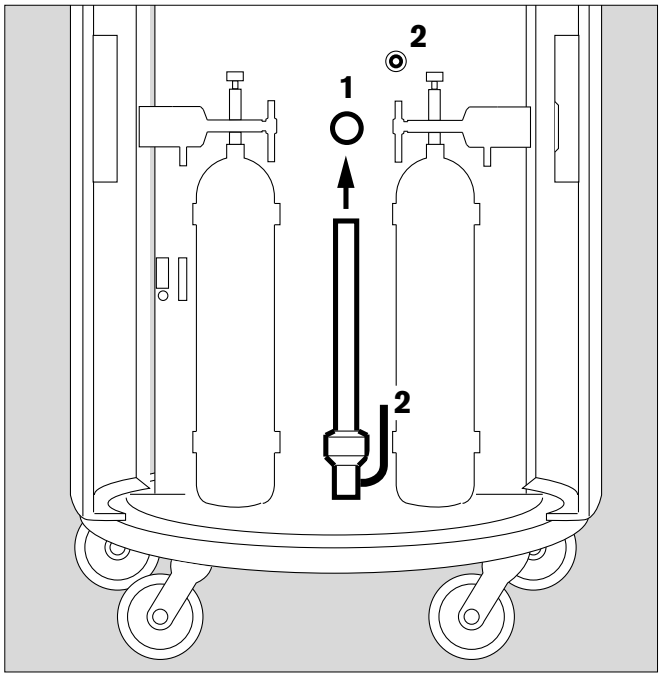


Preparing Gas Disposal Systems

Waste gas connector

1 Slide the tube into the port and tighten it.

2 Connect the small silicone hose to the mixer exhaust gas port and to the connection on the tube.



Sample gas scavenging

- Use hose 11 90 520, connector M 33 151 and sealing cap (optional).

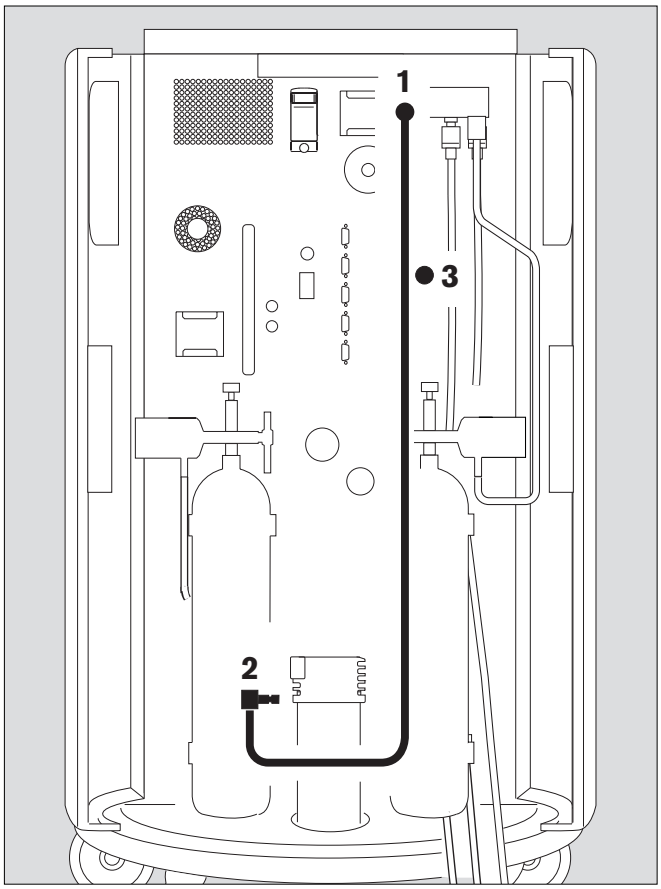
1 Connect the hose to the port of the sample gas outlet port.

2 Attach connector with sleeve to the free end of the hose.
Insert connector into the coupling of the anesthetic gas scavenging system until it clicks into place.

3 Install cap to seal the port.

WARNING !

Make sure scavenger hoses are not pinched, kinked, or blocked in any manner.



Connecting Supplies

Gas Connections

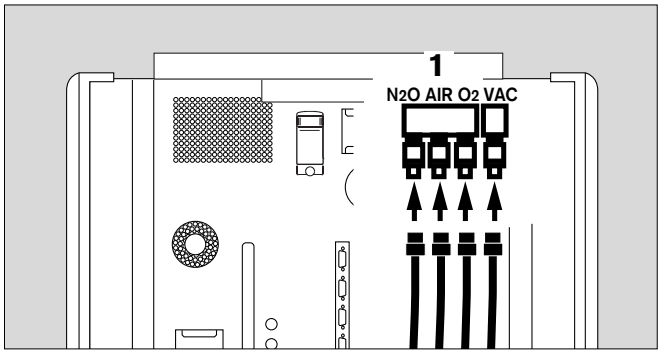
Connecting to pipeline gas supply

WARNING !

Always use medical grade gases that are dry and free from dust and oil. Contaminated gas may cause system malfunction.

1 Screw the gas supply pipeline delivery hoses for O_2, AIR, N_2O, and VAC into the respective inlet ports on the back of the gas supply block. (The two ports at the front of the gas supply block are reserved for the backup gas cylinders.)

Connect the other end of the high pressure gas delivery hoses to the wall or ceiling gas outlets.



WARNING !

Each time you connect a machine to a wall or ceiling gas outlet carefully check hoses to ensure that both ends of the hose are indexed for the same gas. Pipeline delivery hoses used between wall outlets and anesthesia machines have caused accidents when, during assembly, an oxygen fitting was placed on one end of the hose and a nitrous oxide fitting on the other end.

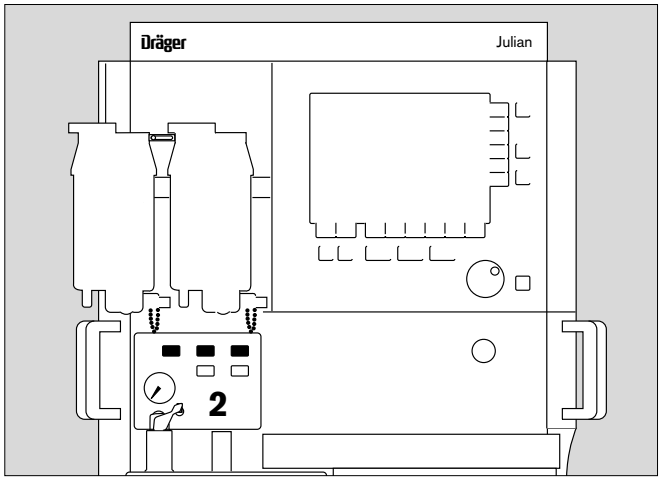
The table below shows color codes of gas connections:

	USA	Canada
O_2	green	white
AIR	yellow	black/white checkered
N_2O	blue	blue
VAC	magenta	magenta

- Ensure that the gas pressures of the gas supply pipeline are between 270 and 550 kPa (39 psi and 80 psi):

2 All pipeline pressure displays must be in the specified range.

The pressure displays light up when the Julian workstation is connected to line power.



Connecting backup gas cylinders for O_2 and N_2O

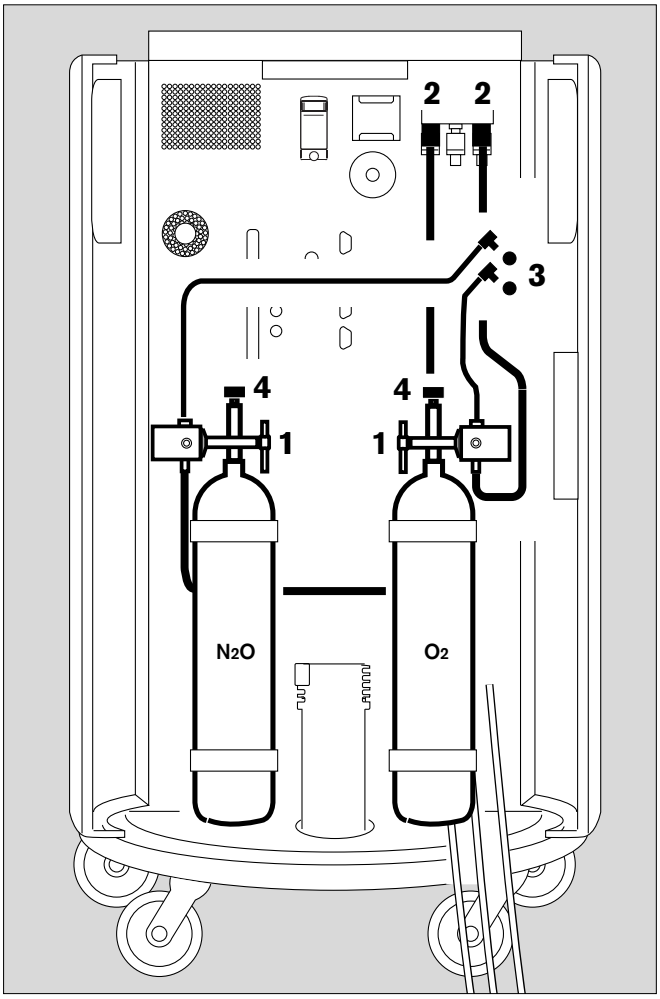
Even if Julian is connected to a gas supply pipeline, the cylinders must remain on the workstation as backup supply.

- On the back of the workstation: place full tanks (E-size) in the cylinder holders and secure in position.

1 Attach pin index pressure reducing adapters onto the cylinder valves.

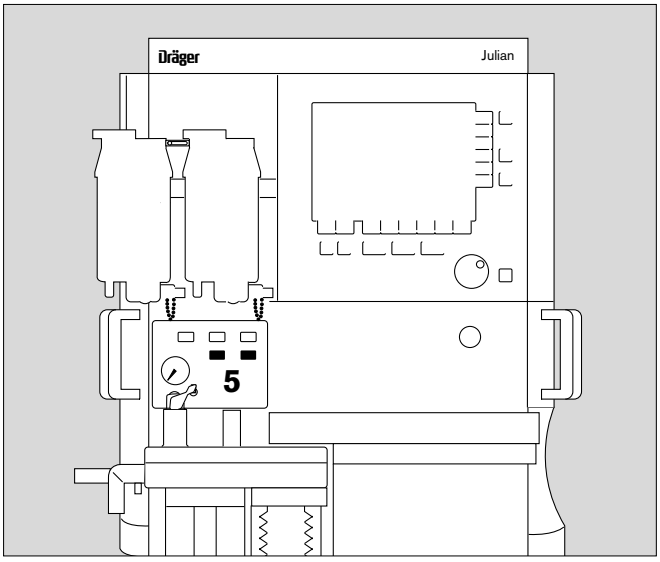
2 Screw the gas hoses into the ports on the front of the gas supply block.

3 Connect pressure sensor cable to the corresponding sensor port.



WARNING !

- **Always use extreme caution when handling O_2 cylinders!**
- **Oxygen intensely supports any burning! No smoking, no open fire in areas where oxygen is in use!**
- **Always secure O_2 cylinders against tipping!**
- **Do not expose O_2 cylinders to extreme heat!**
- **Do not use oil or grease on O_2 equipment such as tank valves or pressure regulators. Do not touch with oily hands. Risk of explosion!**
- **Open and close valves slowly, with smooth turns. Do not use any tools.**
- **If a cylinder valve is leaky or difficult to operate, it must be repaired by an authorized professional.**
- **Max cylinder pressure (O_2 and N_2 O)**
  < 19.000 kPa (2750 psi).



- Check cylinder pressures:

4 Slowly open the cylinder displays.

5 Check the pressure displays.

The pressure displays light up when the Julian workstation is connected to line power.

Anesthetic Gas Scavenging System (Open Reservoir Scavenger)

NOTE: The open reservoir scavenger is intended for use with suction (vacuum) waste gas disposal systems. This approach to scavenging applies continuous suction to transfer waste gas from the scavenger to the disposal system. The open reservoir scavenger is an "open" system in that it uses continually open relief ports for positive as well as negative pressure relief.

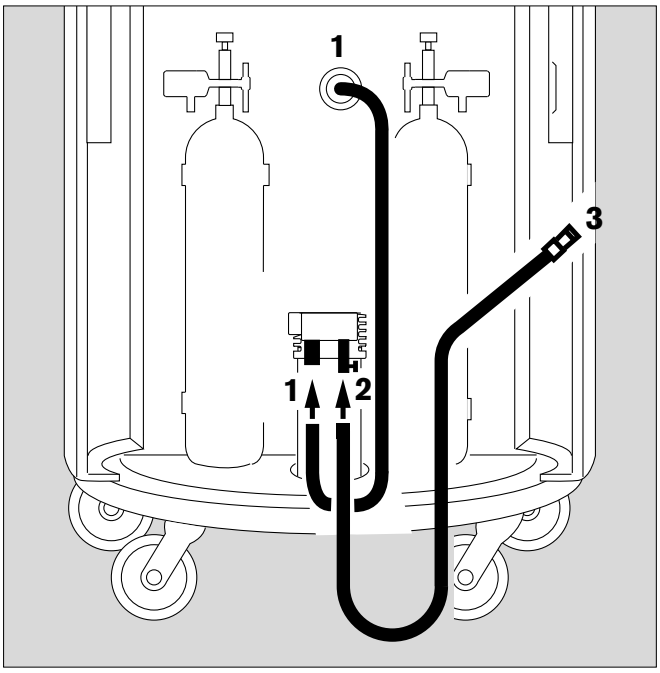
CAUTION !

Do not use anesthetic gas scavenging sytem in combination with extracorporal oxygenator.

1 Connect transfer hose to the waste gas port and to the port of the scavenging system.

2 Connect gas-disposal-assembly tubing to the port of the scavenging system.

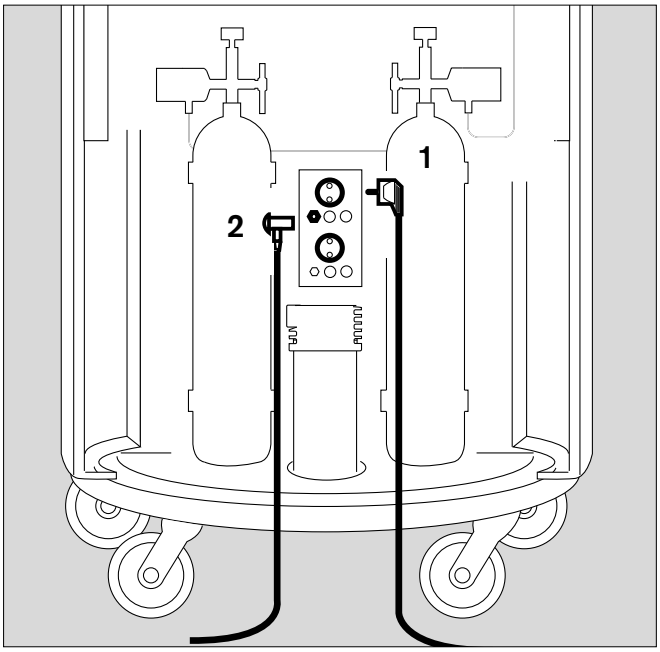
3 Connect gas-disposal-assembly tubing to the wall or ceiling VAC inlet.



Electrical Connections

Auxiliary electrical systems

1 Connect to one of the auxiliary power outlets on the back of the workstation.



WARNING !

Devices connected to auxiliary power outlets will not be powered by the uninterruptible power supply in the event of a power failure.

WARNING !

Restrictions for use of auxiliary power outlets

- **Do not connect HF surgical devices to the auxiliary outlets!**
- **Connecting equipment to the auxiliary outlets may cause the patient leakage current to rise above the permitted values in the event of failure of a protective ground conductor. In such cases, the risk of electric shock cannot be excluded.**
- **Additional power strips must not be connected to the auxiliary outlets.**

Equipotential bonding

e.g. for intracardial or intracranial operations.

2 Connect one end of the grounding cable to one of the grounding pins on the back of the workstation.

- Connect the other end of the grounding cable to the specified equipotential bonding point, e.g. on the operating table or ceiling lamp.

Connecting to line power

The line voltage must be the same as specified on the rating plate on the back of the workstation.
Voltage range: 85 to 265 V

- Plug power plug into wall outlet.

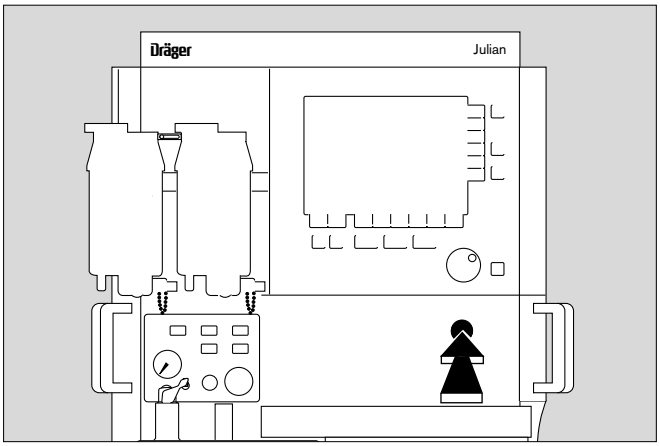
WARNING !

To maintain grounding integrity, connect only to a "hospital grade" receptacle. Always disconnect supply before servicing.

Checks of Readiness for Operation

Checking the System Against the Checklist

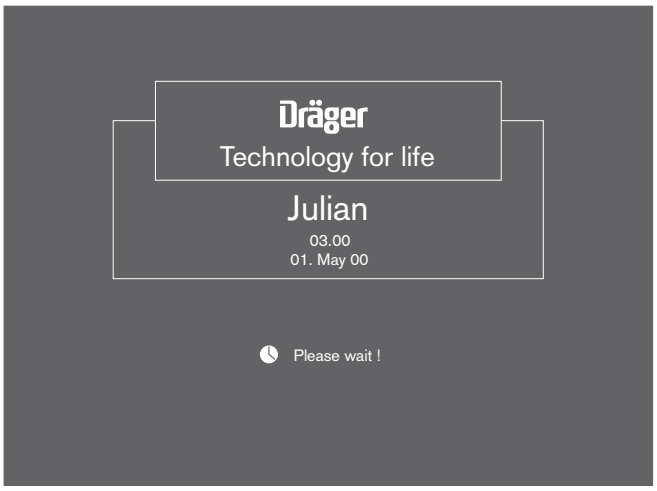
Preconditions:
The workstation must be prepared as described on pages 33 to 36 and assembled ready for operation as described on pages 29 to 32 and 116 to 117.
The gas supply and power supply must be connected.



- Switch on Julian: press the power switch » ⏻ «.

After approximately 10 seconds, the opening screen appears displaying the current software version. Julian now:

– loads its internal software
– checks the internal memory and the CPUs
– tests the communication bus system
– tests the two-channel safety system (Master-Supervisor System)
– checks the speakers.



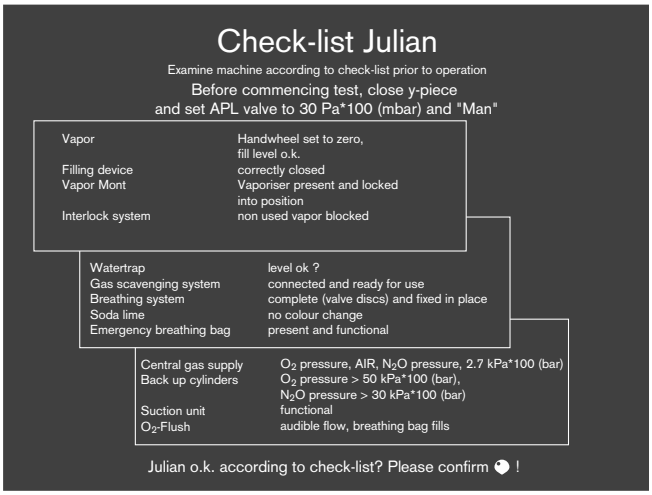
The checklist is displayed after approximately 40 seconds.

- Check the components as instructed in the on-screen checklist.

If the self test has to be interrupted, e.g. for a quick start in an emergency:

- Confirm checklist. After a few seconds, the »**cancel test**« key appears on the screen.
- Press »**cancel test**« key. See "Emergency Start" on page 44 to continue.

NOTE: Check system against check list and perform automatic self test daily.

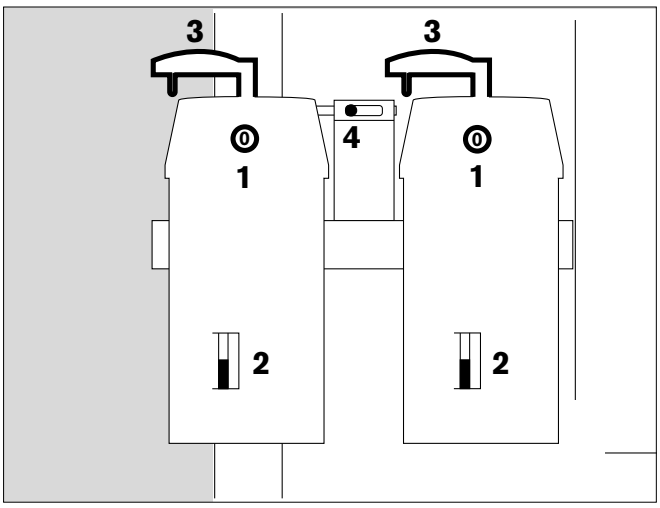


Anesthetic vaporizer (example: Vapor 19.3)

WARNING !

Only use Dräger Vapor® 19.3 or Vapor 2000 with Julian Anesthesia System.

For safe filling procedure, please refer to Operating Instructions of the respective Vapor.



1 Ensure that handwheel is set to "0" and engaged.

2 Filled to sufficient level.

3 Sealing slide valve inserted and screwed tight.

- The plug-in adapter must fit evenly on the connection block.

4 The locking lever must point to the left = locked.

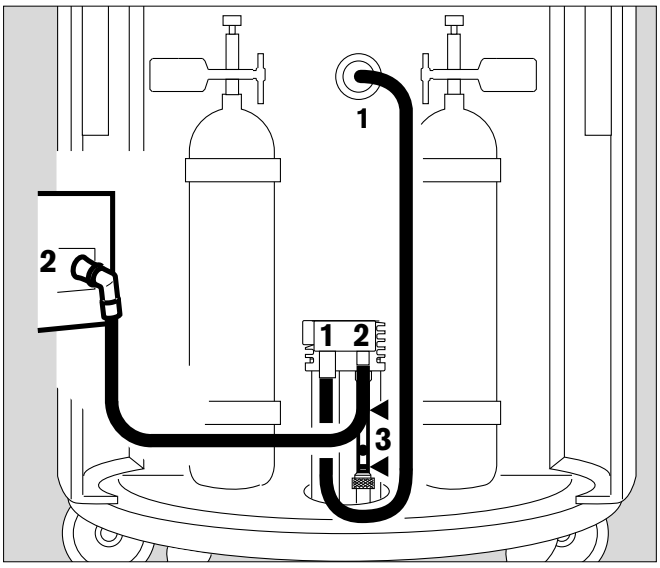
5 The unused Vapor unit must be locked by the interlock slider (example: left-hand Vapor locked).

- Carry out a leakage test, see page 58.

Sample gas water trap

The maximum fill level of the water trap shall be approximately 3 mm below the mark. If the fill level reaches the mark, the water trap needs to be replaced

AGS anesthetic gas scavenging system



1 The transfer hose from the waste gas port must be connected.

2 The gas-disposal-assembly tubing must be connected; the anesthetic waste gas probe must be plugged into the appropriate wall inlet.

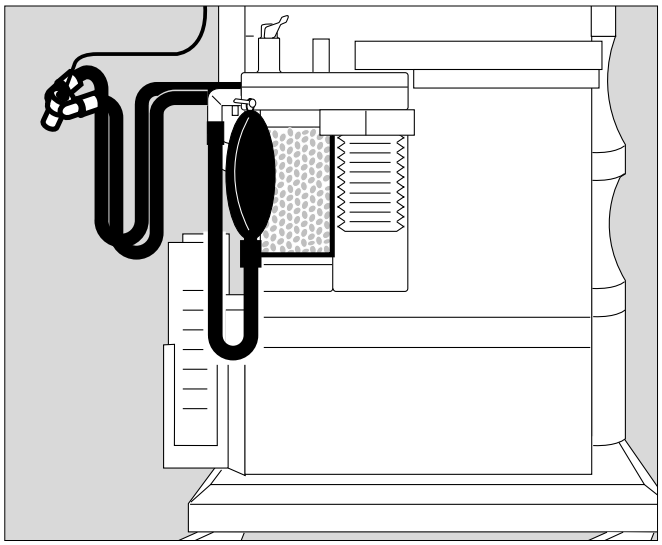
3 Adjust flow regulator to place float between the two marks.

WARNING !

Make sure gas-disposal-assembly tubing is not pinched, kinked, or blocked in any manner.

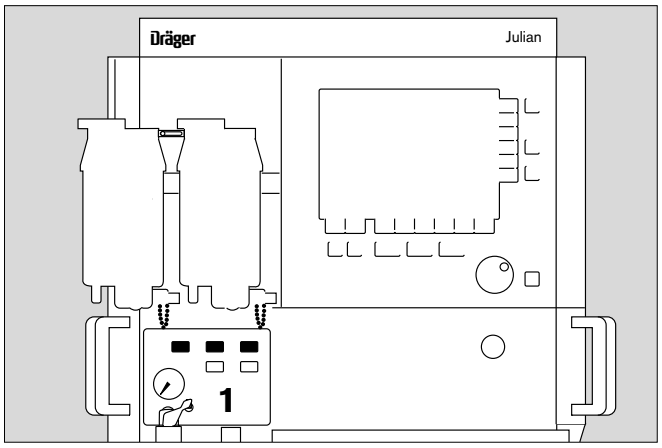
Breathing system

- Complete and engaged, with both valve discs inserted, bellows installed and hoses securely connected.
- Absorbent charge renewed, **no purple discoloration.**



Gas pressures of the gas supply pipelines

1 All pressure displays within the specified range.



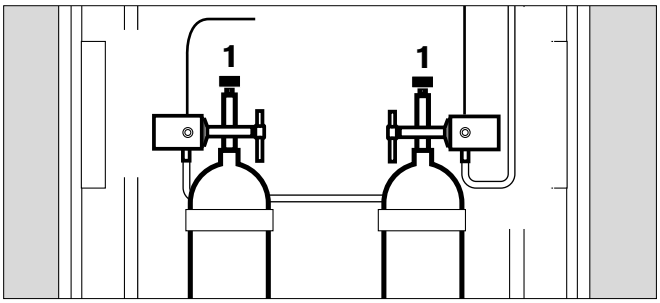
Gas pressures of the backup gas cylinders

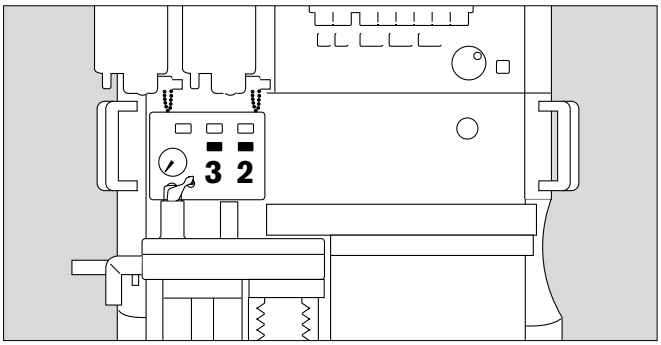
1 Slowly open the cylinder valves.

Check the cylinder pressure displays:

2 O_2 pressure greater than 5000 kPa (725 psi),

3 N_2O pressure greater than 3000 kPa (435 psi).





Suction system

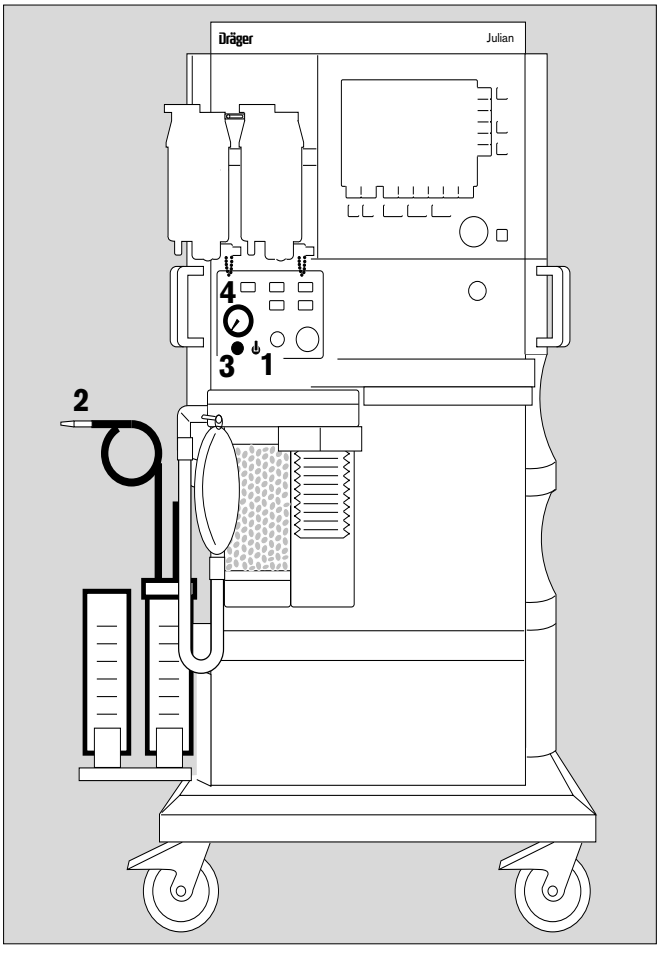
1 Switch to I.

2 Set suction pressure with dial knob.

3 Block the secretion probe adapter or kink the suction hose.

4 Measure the suction pressure on the pressure gauge.

1 Switch to 0.

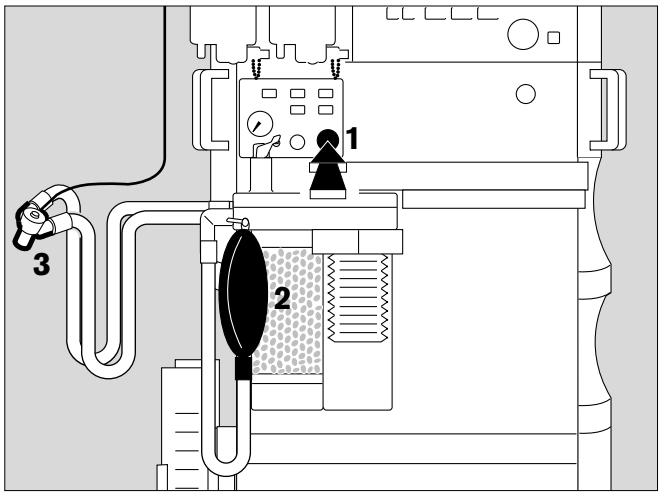


O_2 flush

1 Press »**O_2 +**« button.

2 The breathing bag inflates.

3 O_2 flow is audible.

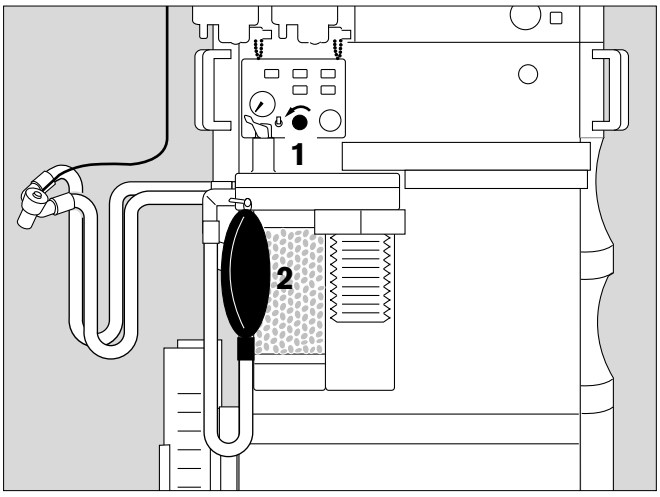


Safety O_2

1 Turn Safety O_2 control valve counterclockwise.

2 The breathing bag fills up.

1 Set Safety O_2 back to » 0 «.



Preparing Julian for the self test

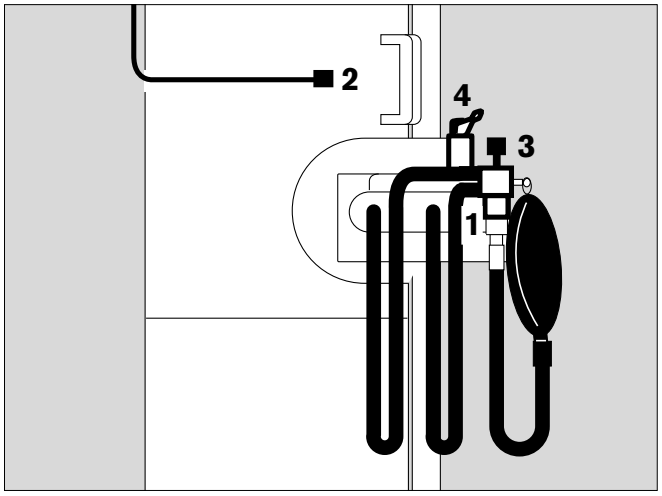
1 Close the Y-piece = plug firmly onto the cone.

2 Ensure that the sample line is not connected to the patient circuit.

3 If necessary, seal the sample-line connector with a luer-lock cap.

4 Set APL valve to MAN and adjust to 30 cmH_2O.

- Ensure that Safety O_2 flow control is set to » 0 «.

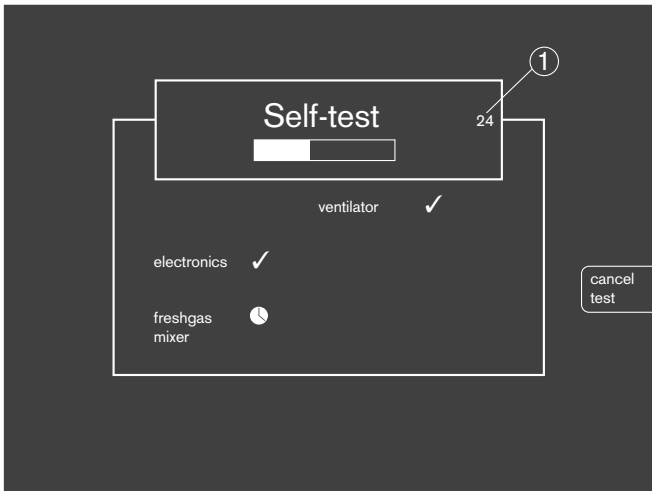


If all points on the checklist are OK:

- Confirm = press dial knob.
  The self test is started.
  Duration: 3 to 4 minutes.
  The self test is performed automatically.

1 Julian essentially carries out the following automatic tests and actions, which are coded:

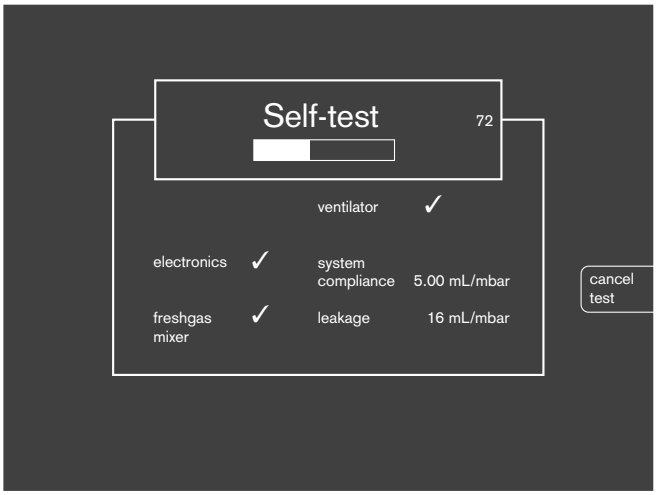
The following list gives an overview of the main steps of the self test:



Electronics (incl. Monitoring)	– gas analyzer test and calibration – O2-sensor test and calibration – PAW-sensor test and calibration – flow sensor check – backup battery check – restoring of default settings for alarm limits, monitoring parameters, ventilator settings, and fresh gas flow control settings
Fresh Gas Flow Control	– gas supplies check(O2, Air, N2O) – gas inlet valves check – pressure sensors calibration – flow control valve calibration – pressure release valve test – check for closed Safety O_2 control valve – fresh gas shortage detection check
Ventilator	– Testing and calibration of PEEP/Pmax valves – Testing of safety valve – Testing of MAN/AUTO switch-over valve – Testing of breathing phase valve – Testing of internal pressure sensor – Determination of compliance and leakage

NOTE: If, during the self test, any malfunction or missing gases are detected, a respective advisory will be displayed on the screen.
In some cases, the user has a choice of accepting the malfunction or of repeating that part of the self test (example: AIR supply not connected).
In other cases, the user has to remedy the problem before the self test can continue (example: O_2 supply not connected).

Display (example):



A check mark (✓) indicates that the respective test point has been completed successfully.
The clock symbol ϴ indicates the test stage is currently in progress.

The system compliance and the leakage of the breathing system and breathing circuit are determined by Julian in the self test.

Depending on the patient circuit used, system compliance is 5 to 6 mL/cmH_2O.

The system will tolerate leaks up to 150 mL/min at 30 cmH_2O.

For leaks of more than 150 mL/min:

- Check patient circuit and repeat leak test.

  After the self test, Julian switches to standby.

Emergency Startup

NOTE: This procedure should only be used when there is no time for the self test!

1 Switch Julian on.

If necessary:

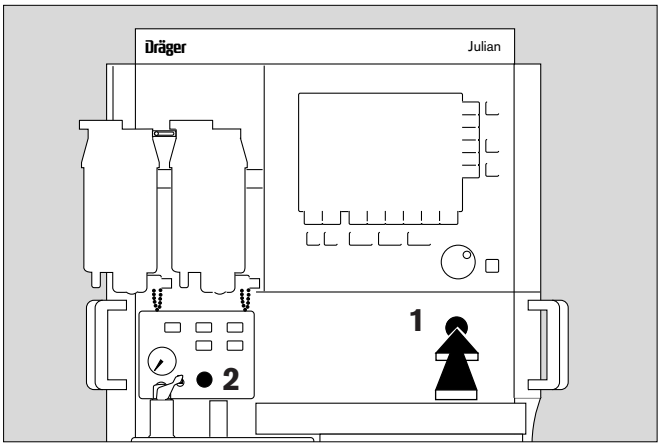
2 Adjust the Safety O_2 flow control to a sufficient flow and ventilate the patient manually .

Check Vapor setting.

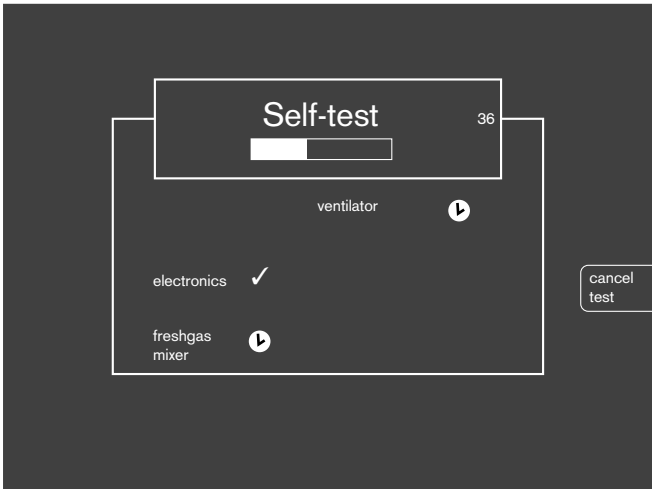
Wait for the software to be internally loaded and for the electronics to be self tested.
After approximately 40 seconds, the checklist appears on the screen.

- Confirm checklist:

Press dial knob.
After a few seconds, the »**Cancel test**« menu key is displayed on the right-hand edge of the screen



Display:



- Press the »**Cancel test**« menu key.

The system now only performs a minimal test.

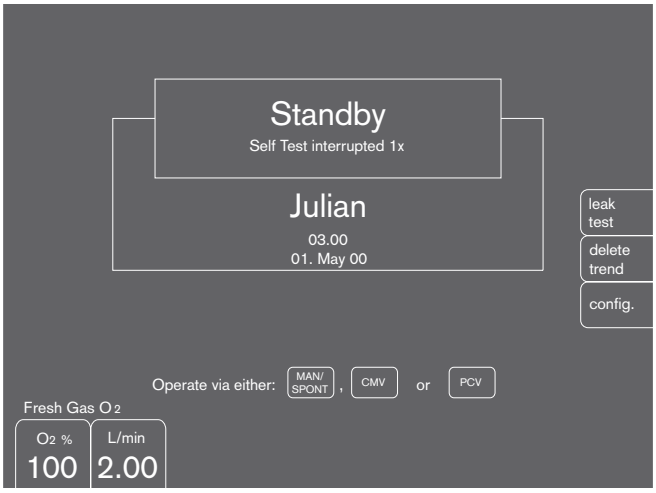
Julian is ready for operation about 1 minute after switching on. Calibration of the O_2 sensor is complete after about 2 minutes.

NOTE: Leak test and compliance test are not performed. Accuracy levels specified under "Technical Data" can therefore not be guaranteed.

NOTE: To prevent abuse of this feature, the self test can only be cancelled 10 times in succession. The self test cannot be cancelled the next time that Julian is started and a complete self test must be performed.

The system switches to standby mode after completing the minimal test.

Display (example):



To switch the standby screen on again:

- Press the dial knob or any other key.

To start Julian:

- Close the Safety O_2 flow control
- Select a ventilation mode, see "Operation", pages 47 to 55.

Operation

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Setting Fresh Gas Concentrations

WARNING !

Always use an anesthesia system that has been cleaned and disinfected and has been successfully tested to be ready for operation.

The fresh gas settings are displayed in the **Standby** screen:

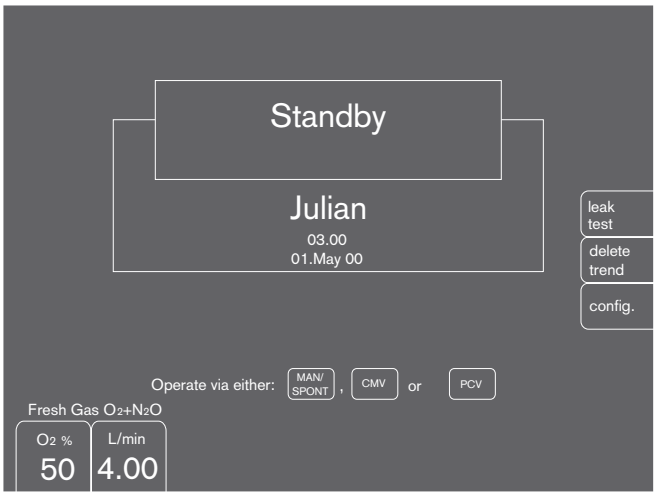
– »**Fresh gas O_2 + N_2O**« or

»**Fresh gas O_2 + AIR**«

– O_2 concentration »**O_2 %**«

– Fresh gas flow »**L/min**«

The settings correspond to the default values configurable after switching on and after entering standby mode. The fresh gas settings can be modified before selecting a ventilation mode.
No fresh gas is delivered in standby mode. Fresh gas flow is not enabled until a ventilation mode has been started.



Adjustment ranges and factory default settings

Fresh gas parameters	Adjustment range	Factory default settings
Carrier gas	AIR or N_2O	N_2O
O_2 %	25 to 100	100
Fresh gas flow L/min	0* ; 0,5 to 12	2

* Only in MAN/SPONT mode

Selecting the carrier gas

1 Press »**N_2O**« or »**AIR**« key.
The yellow LED in the selected key will start flashing.

● Press the dial knob to confirm. The yellow LED will be lit continuously.

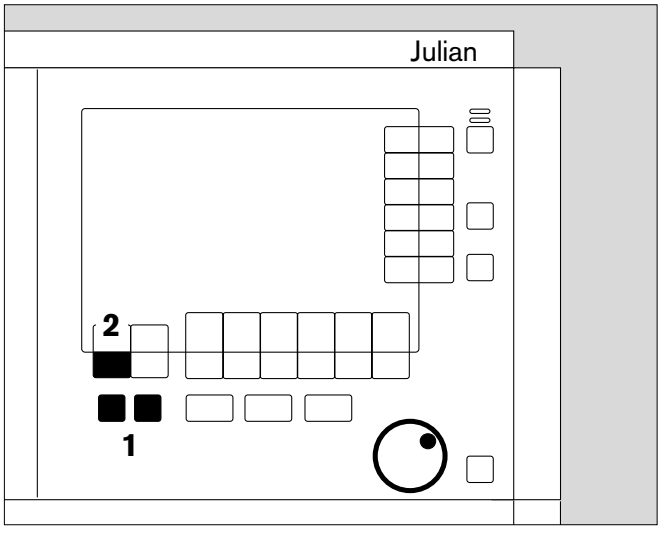
The selected fresh gas components are displayed on the screen.

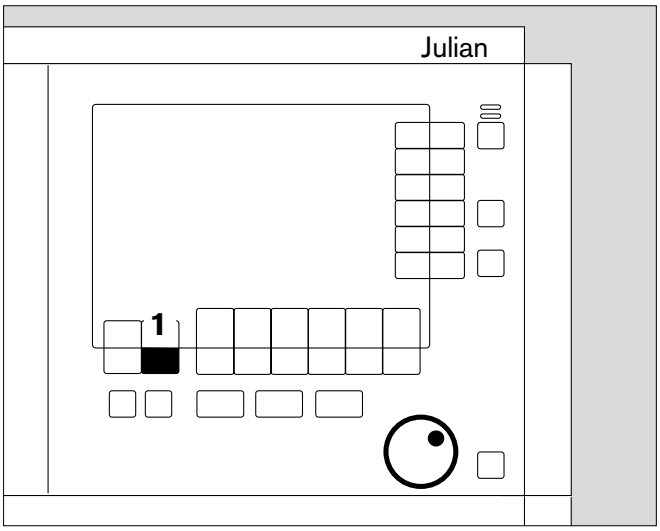
Setting the O_2 concentration

2 Press the menu key »**O_2%**«.

The key field will be highlighted (inversed).

● Set and confirm O_2 concentration with the dial knob.





Setting fresh gas flow

1 Press »**L/min**« menu key.

The key field appears dark against a light background.

- Set and confirm fresh gas flow with the dial knob.

Setting 0 L/min (no fresh gas flow) is only available **MAN/ SPONT**. When changing to **CMV** or **PCV** the fresh gas flow is automatically increased to the minimum setting of 0.5 L/min.

The default settings in effect whenever Julian is switched on can also be modified; see "Setting Default Values" on page 92.

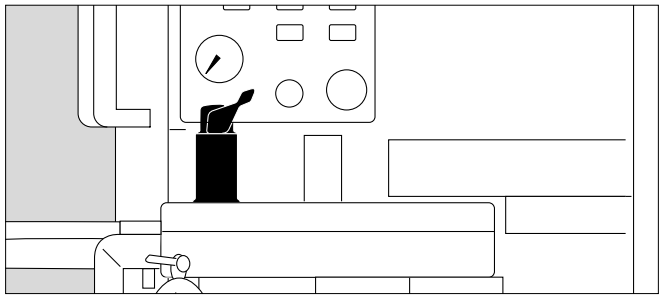
Julian is equipped with an electronic O_2 minimum dosing system to avoid hypoxic gas mixtures. For fresh gas flow settings below 1 L/min, the O_2 concentration is automatically increased to a value corresponding to an O_2 flow of 250 mL/min. If this control system becomes activated, the O_2 value is highlighted in addition to the active menu key »**L/min**«.

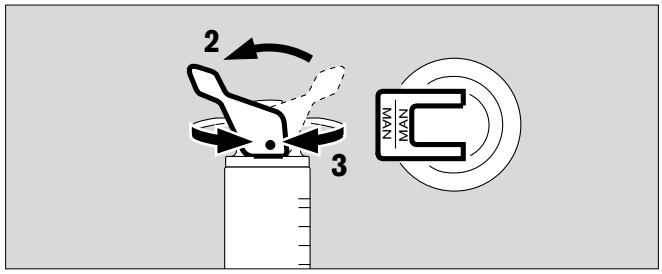
Julian is able to detect fresh gas deficiency . An optical system monitors the end-expiratory position of the bellows. If the bellows is not filled sufficiently during expiration, the alarm 'FRESH GAS? !' appears.
In this case the fresh gas flow should be increased to an adequate value.

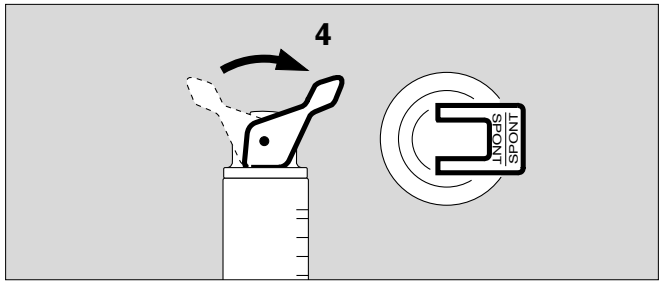
Selecting Ventilation Modes

MAN/SPONT Ventilation Mode

Choose between manual ventilation **MAN** and spontaneous breathing **SPONT** on the Adjustable Pressure-Limiting valve (APL valve):







Manual ventilation

2 Set the lever of the APL valve to **MAN.**

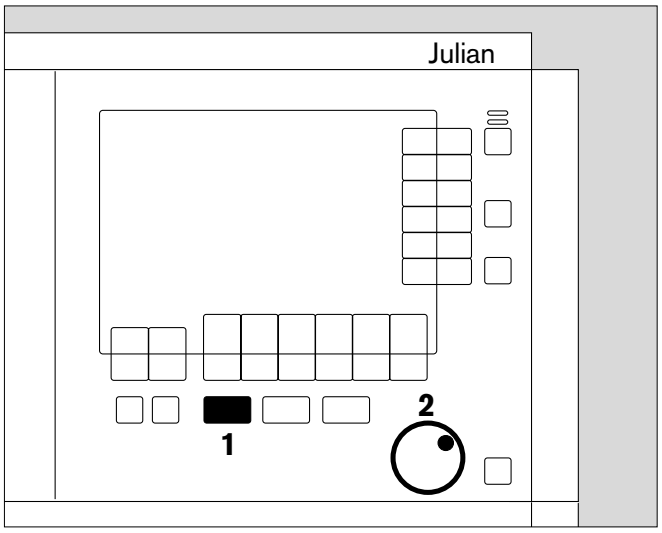
3 Set the pressure limit = rotate lever.

Spontaneous breathing

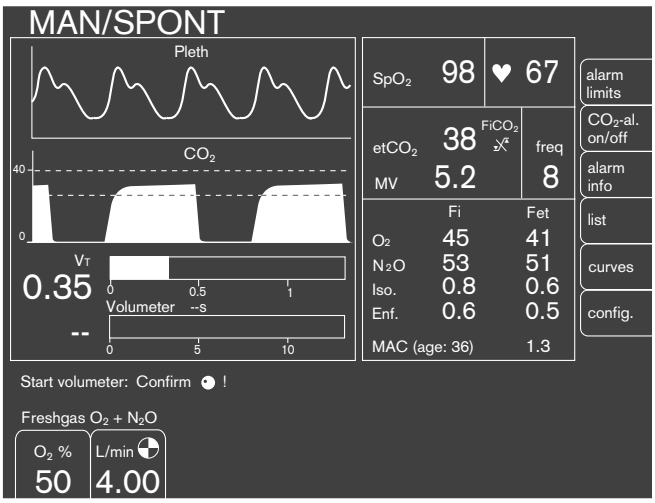
4 Set lever of the APL valve to **SPONT.** The valve is now open for spontaneous breathing regardless of the set pressure limit.

1 Press »**MAN/SPONT**« key,

2 and confirm with the dial knob.



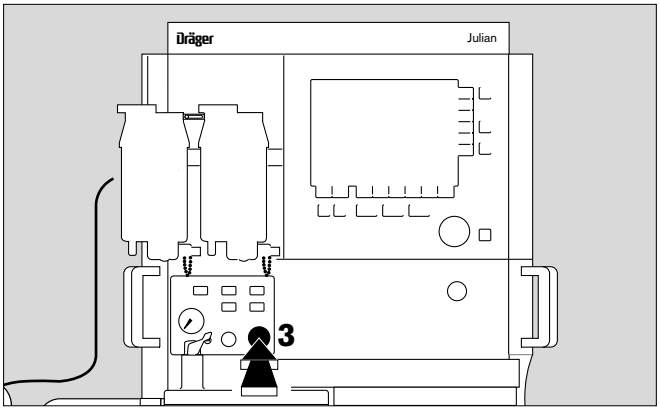
Display (example):



O2 flush

– For flushing and rapidly filling the breathing system and breathing bag with O2 while bypassing the vaporizer.

3 Press »**O2 +**« button.
O2 flows into the breathing system without anesthetic gas as long as the button is pressed.



Certain alarms are automatically switched off in MAN/SPONT ventilation mode in order to avoid nuisance alarms. Disabled alarms are identified by a gray background in the table below.

Alarm	Limits	In MAN/SPONT mode	Factory default setting
SpO_2	↓↑	ON ON	– – 92
Pulse ♥	↓↑	ON ON	120 50
$EtCO_2$	↓↑	* *	50 mmHg – –
$FiCO_2$	↑	*	– –
MV	↓↑	* *	– – – –
FiO_2	↓↑	* ON	– – 20
Fi Hal.	↓↑	ON OFF	1.5 – –
Fi Iso.	↓↑	ON OFF	2.3 – –
Fi Enf.	↓↑	ON OFF	3.4 – –
Fi Des.	↓↑	ON OFF	12.0 – –
Fi Sev.	↓↑	ON OFF	3.4 – –
PAW	↓↑	ON OFF	40 – –
Apnea	pressure	OFF	
Apnea	flow	OFF	
Apnea	CO_2	ON	active after 60 sec.

– – : The alarm limit is deactivated as factory default.

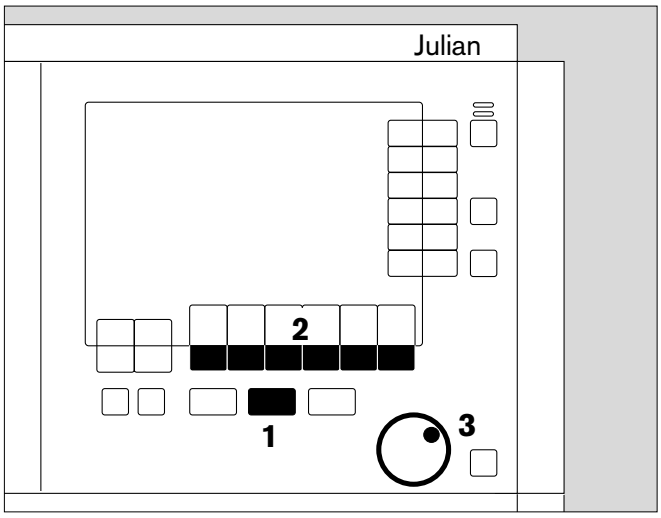
* The $EtCO_2$ ↓↑, $FiCO_2$ ↑, MV ↓↑ and FiO_2 ↑ alarms can be configured »**ON**« or »**OFF**« in standby mode for the transition from MAN/SPONT. When the alarm limits are set to »**ON**«, the value is transferred from automatic ventilation mode.

To set the values of the alarm limits during operation see page 72.

To configure the default alarm limits, see page 96.

CMV Ventilation Mode

CMV = **C**ontinuous **M**andatory **V**entilation
Volume-controlled ventilation with fixed mandatory minute volume (MV), set with the tidal volume (V_T), and the respirtory rate (Freq.).



Presetting the ventilation parameters for CMV

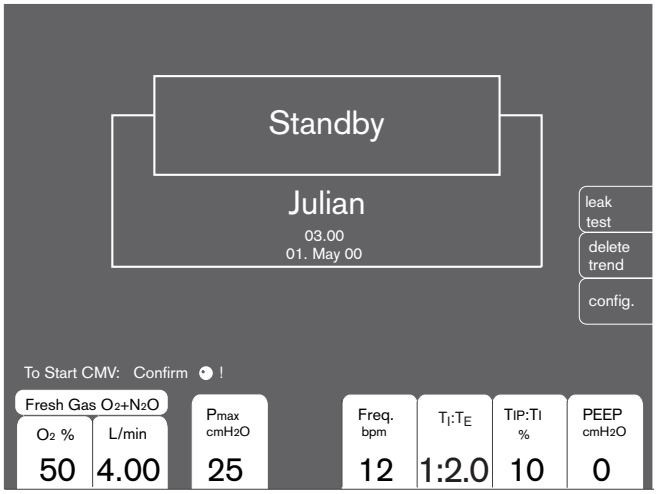
1 Press »**CMV**« key; its LED will start flashing.

- The six ventilation parameters for CMV are displayed on the screen with their default settings.

2 Press the menu key for the desired ventilation parameter.

3 Set and confirm the ventilation parameter with the dial knob.

Display (example):



Adjustment ranges and factory default setting

Ventilation parameters	Adjustment range	Factory default setting *
Pressure limit Pmax [cmH2O]	10 to 70	25
Tidal volume V_T [mL]	50 to 1400	600
Frequency Freq. [1/min]	6 to 60	12
Insp/Exp ratio $T_I : T_E$	2.0:1 to 1:2.0 in increments of 0.1, 1:2.0 to 1:4.0, in increments of 0.5	1 : 2.0
Insp. pause time : Insp. time $T_{IP} : T_I$ [%]	0 to 50	10
PEEP [cmH2O]	0 to 20	0

For tidal volumes V_T of less than 200 mL:

- Use a pediatric patient circuit, see page 59 "Ventilating Children".

* User-specific defaults may be selected, see page 100.

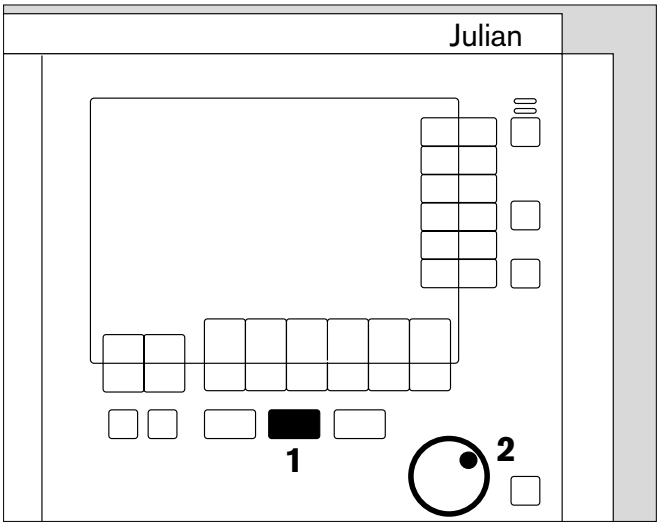
Inspiratory flow in CMV mode ranges from 3 to 75 L/min. Limits for ventilation parameter settings are dependent on this flow range.

For tidal volumes V_T of less than 200 mL:

- Use a pediatric patient circuit, see page 59 "Ventilating Children".

In CMV mode, Julian will automatically compensate for the compliance of the breathing system and hoses. This ensures that the delivered tidal volume corresponds to the volume setting. In some cases, the volume compressed in the breathing system may not be fully compensated due to the ventilator's flow limitation of 75 L/min.

In the CMV mode, the fresh-gas flow setting may be limited to a value corresponding to the actual inspiratory pause time. During the inspiratory pause, fresh gas is not delivered in order to obtain an increase of plateau pressure.
If the CMV mode is activated and the fresh-gas flow setting is 12 L/min, the flow will automatically be limited to the maximum possible value corresponding to the inspiratory pause time. This limited value has to be confirmed before starting CMV.

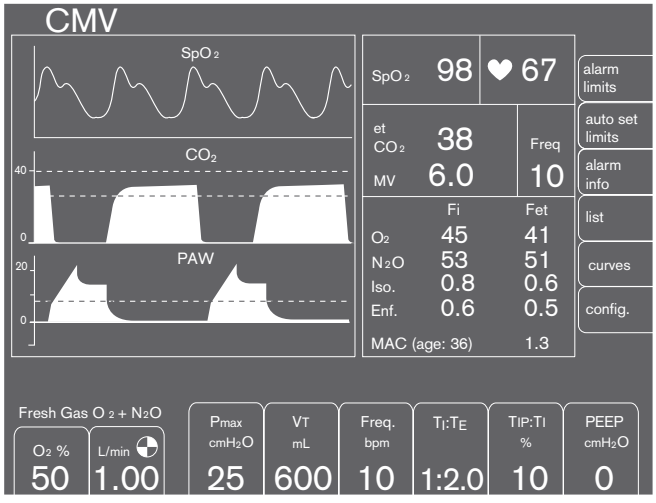


Starting CMV

1 Press »**CMV**« key

2 and confirm with dial knob.

Display (example):



The preset ventilation parameters are displayed on screen.

The ⊕ symbol rotates in the menu key »**L/min**« to indicate that fresh gas is flowing.

If a change in ventilation parameters is required:

- Press corresponding menu key. Set and confirm ventilation parameter with the dial knob.

Alarms effective in CMV mode:

Alarm	Limits	In CMV mode	Factory default setting
SpO_2	↓↑	ON ON	– – 92
Pulse ♥	↓↑	ON ON	120 50
$EtCO_2$	↓↑	ON ON	50 mmHg – –
$FiCO_2$	↑	ON	5 mmHg
MV	↓↑	ON ON	– – 3.0
FiO_2	↓↑	ON ON	– – 20
Fi Hal.	↓↑	ON ON	1.5 – –
Fi Iso.	↓↑	ON ON	2.3 – –
Fi Enf.	↓↑	ON ON	3.4 – –
Fi Des.	↓↑	ON ON	12.0 – –
Fi Sev.	↓↑	ON ON	3.4 – –
PAW	↓↑	ON ON	40 8
Apnea	pressure	ON	Active after 15 seconds
Apnea	flow	ON	Active after 15 seconds
Apnea	CO_2	ON	Active after 30 seconds

– – : The alarm limit is deactivated as factory default.

To set the values of the alarm limits during operation see page 72.

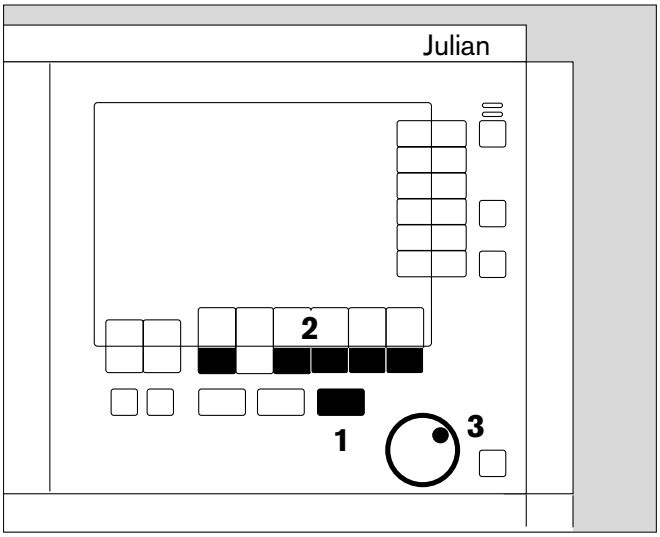
To set the default alarm limits see page 98.

PCV Ventilation Mode

PCV = **P**ressure **C**ontrolled **V**entilation

In pressure controlled ventilation mode, the applied tidal volume depends on the ventilation parameters Pmax and PEEP as well as on lung compliance.

Changes in ventilation parameters or lung compliance influence tidal volume. Minute volume (MV or V_t) must therefore be monitored continuously.



Presetting ventilation parameters for PCV

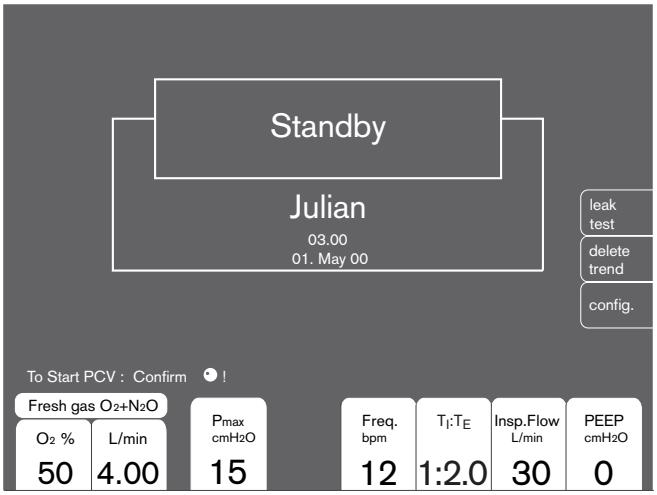
1 Press »**PCV**«. Its LED will start flashing.

- The five ventilation parameters for PCV appear on the screen with their default settings.

2 Press menu key of the respective ventilation parameter.

3 Set and confirm ventilation parameter with the dial knob.

Display (example):



Adjustment ranges and factory default settings

Ventilation parameter	Adjustment range	Factory default setting *
Pressure limit Pmax [cmH_2O]	(PEEP+1) to 70	15
Breathing rate (Freq.) [bpm]	6 to 60	12
Insp./Exp. ratio T_I : T_E	2.0:1 to 1:2.0 in increments of 0.1, 1:2.0 to 1:4.0, in increments of 0.5	1 : 2.0
Insp. flow [L/min]	5 to 50 (75**)	30
PEEP [cmH_2O]	0 to 20	0

When ventilating infants and small children weighing less than 20 kg:

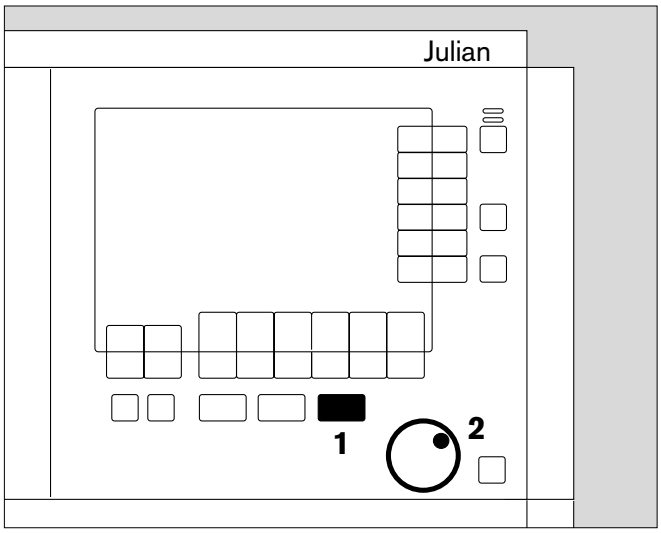
- Use pediatric patient circuit; see page 59. "Ventilating Children".

* User-specific defaults may be selected, see page 102.
** See technical data, page 140.

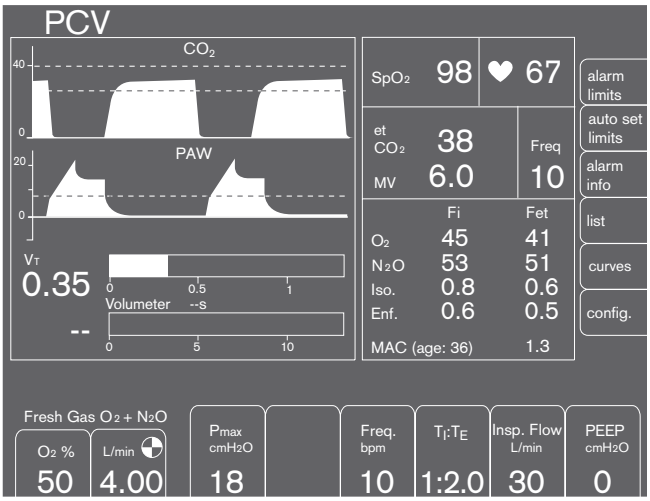
Starting PCV

1 Press »**PCV**«.

2 Confirm by pressing the dial knob.



Display (example):



The preset ventilation parameters appear on the screen.

Fresh gas is flowing, as indicated by the rotating symbol ◔ in the menu key »**L/min**«.

If a change in ventilation parameters is required:

- Press the respective menu key. Set and confirm the ventilation parameter with the dial knob.

Alarms effective in PCV mode:

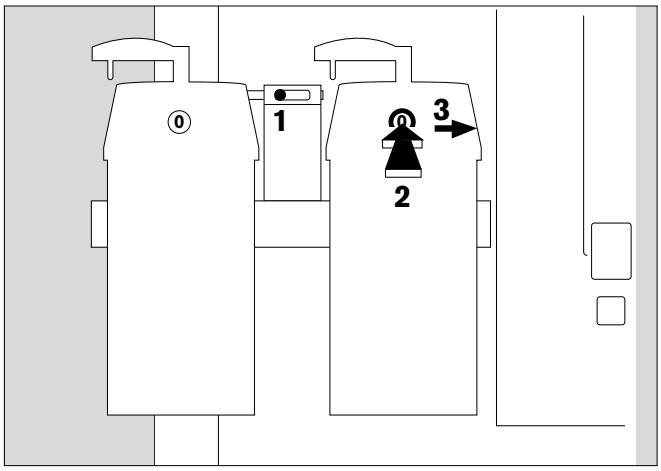
Alarm	Limits	In PCV mode	Factory default settings
SpO_2		ON ON	– – 92
Pulse ♥		ON ON	120 50
$EtCO_2$		ON ON	5 mmHg – –
$FiCO_2$		ON	5 mmHg
MV		ON ON	– – 3.0
FiO_2		ON ON	– – 20
Fi Hal.		ON ON	1.5 – –
Fi Iso.		ON ON	2.3 – –
Fi Enf.		ON ON	3.4 – –
Fi Des.		ON ON	12.0 – –
Fi Sev.		ON ON	3.4 – –
PAW		ON ON	40 8
Apnea	pressure	ON	Active after 15 seconds
Apnea	flow	ON	Active after 15 seconds
Apnea	CO_2	ON	Active after 30 seconds

– – : The alarm limit is deactivated as factory default.

To set the values of the alarm limits during operation see page 72.

To set the default alarm limits see page 98.

Setting Vapor

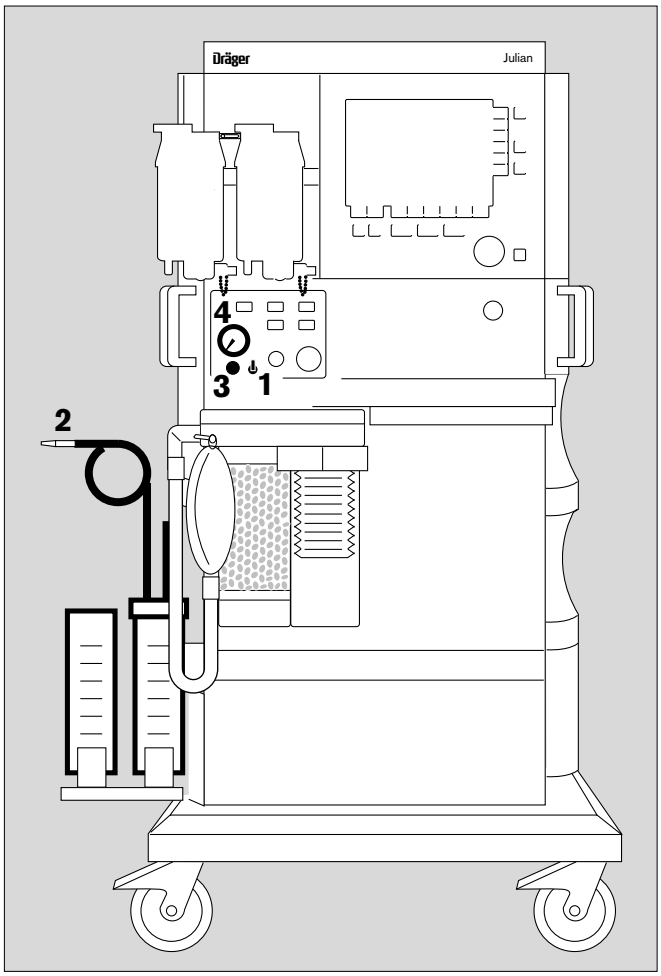


1 Lock the unused Vapor
= push lever fully in the direction of the unused Vapor (example: left Vapor locked).

2 Press the » **O** « button and

3 set the handwheel to the required anesthetic agent concentration.

Aspirating Secretions



- Swing the suction system forwards.

1 Set switch to » **I** «.

2 Seal the secretion probe adapter or kink the suction hose,

3 Set the appropriate suction pressure for the patient with the rotary knob »**Vac**.« and

4 check vacuum on the pressure gauge.

NOTE: Graduation indicators are for approximation only.

WARNING !

Always follow accepted hospital procedures for handling body fluids.

After aspirating

- Rinse the suction hose with the water purifier.

1 Set switch to » **0** «.

At the End of Each Anesthesia Case

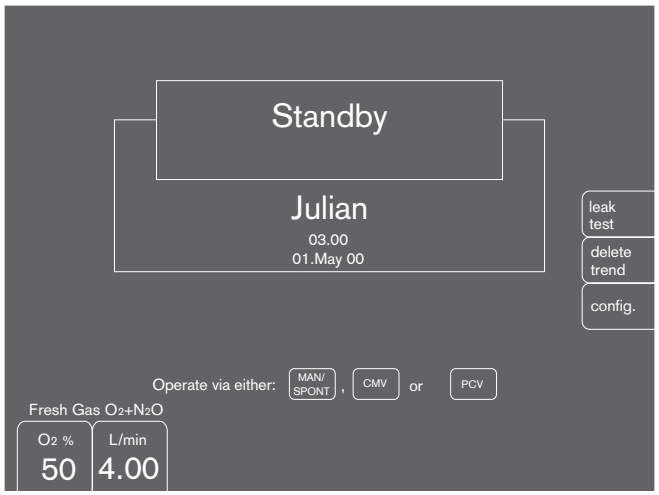
To switch Julian to standby:

- Press Standby key ⏻ and confirm with the dial knob.

The functions of the workstation are switched off. Current alarm limits are cancelled and default settings for anesthetic gas delivery, ventilation parameters, and for alarm limits are restored.
Alarms that had been disabled in the configuration menu will be enabled again (HLM off, CO_2 alarm on, SpO_2 alarm on).

If the patient breathing circuit has been changed:

- Perform a leak test, page 58.



Changing Absorber Charge

– If 2/3 of the soda lime charge has turned purple.

– If the inspiratory CO_2 concentration $FiCO_2$ equals 5 mmHg or more ($FiCO_2$ high alarm present).

– If the absorber contains liquid and draining becomes necessary.

WARNING !

Absorbent is caustic and is a strong irritant to the eyes, skin, and respiratory tract. When emptying or filling absorber, take care not to spill its contents.

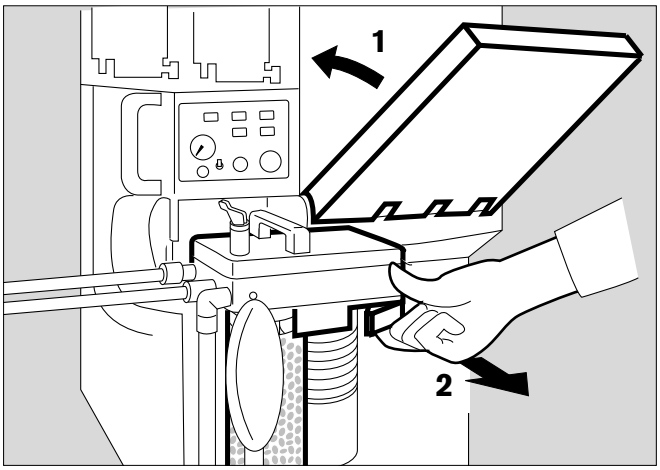
- Press the Standby key ⏻ and confirm by pressing the dial knob.

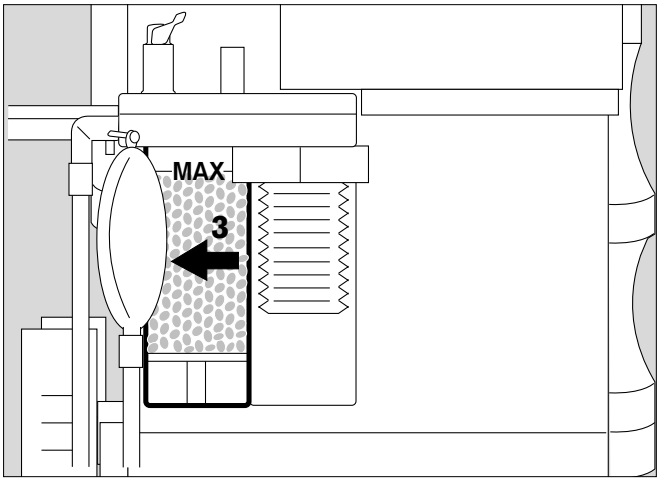
1 Raise the writing top.

2 Pull the catch and slide breathing system out at the same time.

3 Turn the absorber counterclockwise and pull it out downwards.

- Drain the used soda lime and dispose of together with domestic waste.
- Fill the absorber with fresh soda lime up to the MAX mark.
- Install the absorber to the breathing system from below and turn it clockwise as far as it will go.
- Push the breathing system inwards until it clicks into place.
- Fold down the writing top.





Leak Test

WARNING !

Do not perform leak test while a patient is connected to the anesthesia workstation.

– When the soda lime has been changed

or

– when the breathing hoses or breathing system has been changed.

– if the Vapor has been changed or topped up

- test with the handwheel set to »**0**« and
- test with the handwheel set to less than 0.2% by vol.
- After the leak test, turn handwheel to »**0**«.

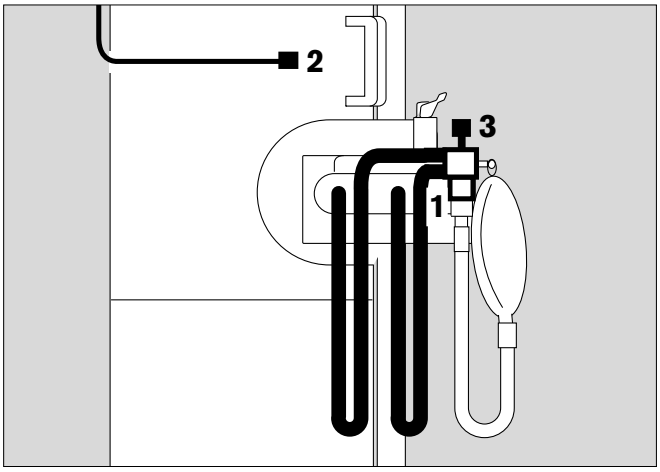
1 Close the Y-piece = place firmly on the cone.

2 Ensure that the sample line is not connected to the patient circuit.

3 If necessary, seal the sample-line connector with a luer-lock cap.

- Press the softkey »**leakage**« in standby mode.

Julian performs the leak test for CMV/PCV and determines the volume correction for system compliance, duration approx. 30 seconds.
The breathing bag and its hose are not included in the test.

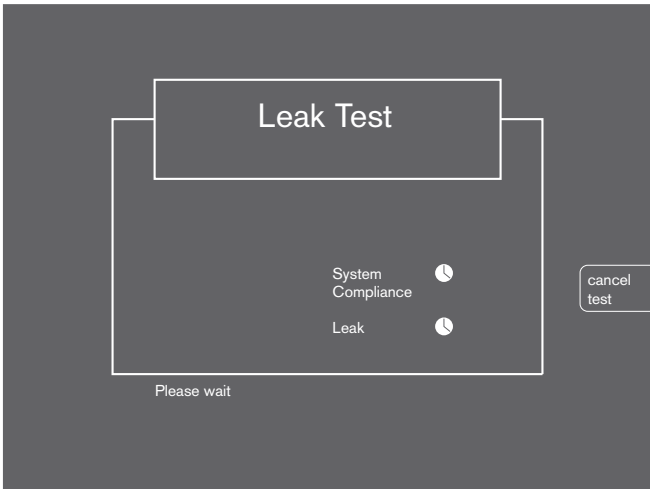


Display:

When the test has been completed successfully, the clock symbol disappears and the values for leakage and system compliance are displayed.
The results of the leak test are also displayed on the data screen page.

To return to the Standby screen:

- Press dial knob.

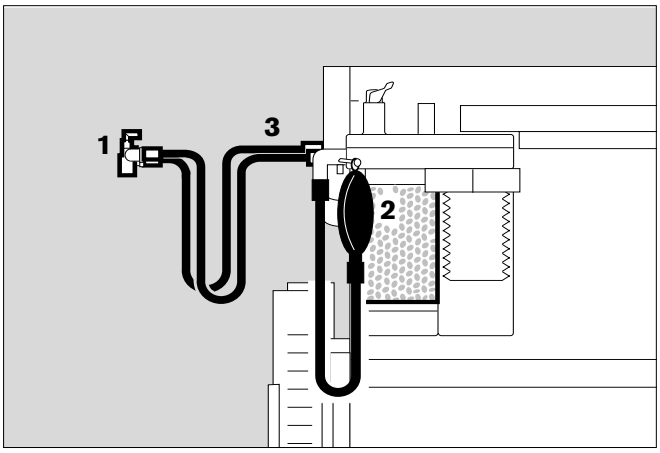


Ventilating Children

For tidal volumes VT of less than 200 mL:

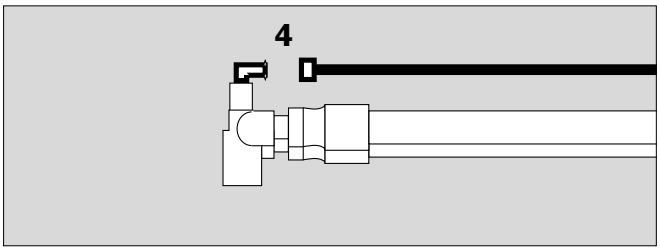
- Use pediatric breathing circuit

Connecting the breathing circuit



1 Connect 0.5 L breathing bag with connector to the breathing hose with the large connection sleeves. Slip breathing hose over the elbow connector. Hang breathing bag onto the hook.

2 Slip breathing hoses with the large cuffs onto the inspiratory and expiratory ports and connect the small cuffs to the Y-piece.



3 Connect the sample line to the Y-piece and water trap.

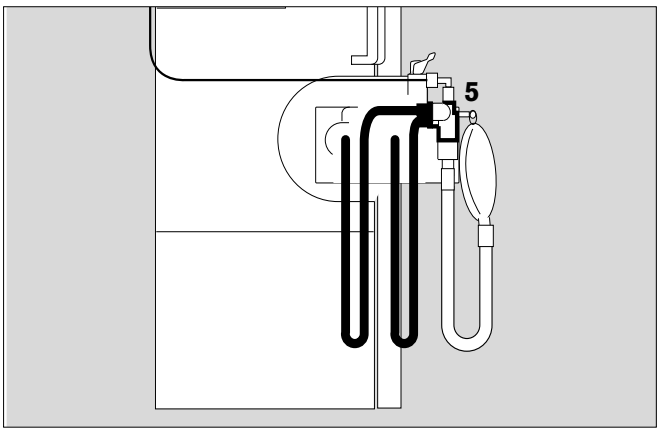
- Set the sample rate to 200 mL/min, page 96.
- Increase tidal volume VT to compensate for the sample gas flow.

Volumeter function:

- Select "child" scale, page 80.

Self-test and leak test:

4 Firmly connect the Y-piece to the cone.



- Determine the system compliance and leak-test, see page 58.

When using CMV mode:

The system compliance will automatically be compensated to ensure that the delivered tidal volume corresponds to the volume setting.

- Use PCV or CMV mode.

Auxiliary Oxygen Flowmeter

For the delivery of a metered flow of pure oxygen (e.g., delivery through a nasal cannula), an optional auxiliary oxygen flowmeter can be mounted on the left side of the Julian workstation (see page 130, What's What). This flowmeter can also be used when the anesthesia machine is turned off.

In the Event of Supply Failures

In the Event of a Power Failure

Julian will automatically switch to the integrated uninterruptible power supply (UPS).
If the battery is charged, operation will be maintained for at least 30 minutes.

WARNING !

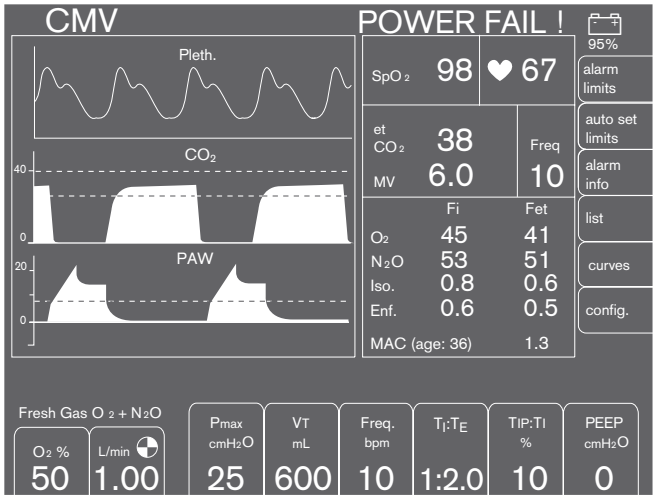
Devices connected to the auxiliary outlets will not be powered by the uninterruptible power supply in the event of a power failure.

The message **POWER FAIL!** appears on the screen together with the remaining available battery capacity in percent.

Example: **95 %**

If the battery is almost completely discharged, the message **BATTERY LOW !!!** appears on the screen.

Julian then automatically switches to **MAN/SPONT** ventilation mode.



- Adjust safety O2 flow control to a sufficient flow level (1-12 L/min).
- Check Vapor setting.
- **Ventilate patient manually!**

In the Event of a Gas Failure

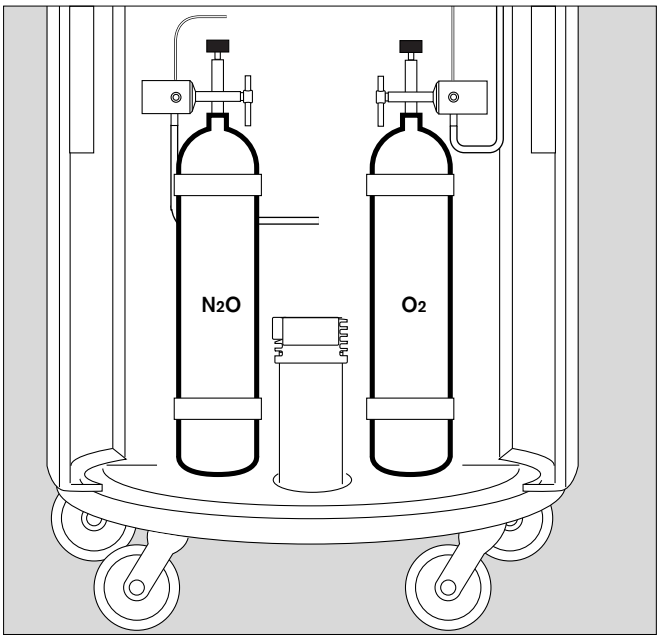
Julian generates an alarm if the O_2, AIR or N_2O supply fails.

- Open the valve on the corresponding backup gas cylinder on the rear of the workstation if it had been closed.
- Check pressure display for the backup gas cylinder
- Reestablish supply from pipeline.

If there is no backup supply of gas available, Julian replaces the set gas mixture with AIR or O_2:

Julian delivers 100 % AIR if the O_2 supply fails.
Julian delivers 100 % O_2 if the N_2O supply fails.
Julian delivers 100 % O_2 if the AIR supply fails.

The amount of fresh gas flow (L/min) remains constant.



Fresh gas metering is still possible even in the event of failure of one of the gases. For example, if the N_2O supply fails, AIR can be selected as the carrier gas.

Julian is equipped with two independent gas supply failure alarm systems.

If the supply pressure of O_2, AIR, or N_2O drops below 270 kPa (39 psi), the corresponding pressure display on the front panel starts flashing. In the event of an O2 supply failure, an uninterruptible continuous audible alarm is generated.

If, in the event of inadequate gas supply (O_2, AIR, or N_2O, fresh gas flow control is not able to deliver the set fresh gas mixture, a corresponding warning is displayed in the alarm field on the screen accompanied by a continuous audible alarm.

An O_2 failure alarm is always signalled with the maximum alarm volume.

In the Event of a Major Hardware Fault

In this case, the message **SYSTEM FAULT** will be displayed and an audible alarm is generated.

In the event of a hardware fault including the screen, the audible alarm is generated only.

In these cases, Julian automatically switches to **MAN/SPONT** ventilation mode.

No N_2O will be delivered in this mode.

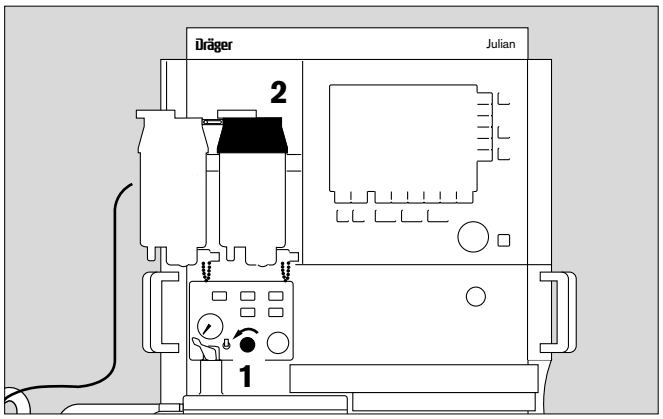
1 Adjust safety O_2 flow control to a sufficient flow level (1-12 L/min).

2 Check Vapor setting.

- Ventilate patient manually.

To silence the audible alarm:

- Press dial knob.



In the event of system failure which also does not allow an automatic switch to safe state the user may turn off the Julian and ventilate the patient manually.

1 Adjust safety O2 flow control to a sufficient flow level (1-12 L/min).

2 Check Vapor setting.

- **Ventilate patient manually!**

End of Operation

To switch Julian to standby mode:

- Press ⏻ key and confirm by pressing the dial knob.

The Julian Workstation is now in standby mode.
Fresh gas flow is switched off.

WARNING !

Manual ventilation is not possible when Julian is in standby mode!

The following default values are activated in standby mode:
Fresh gas default values
Ventilation parameters
Alarm limits

To switch Julian off:

- Press power switch » ■○⊙▬ « down completely.

The system is switched off after 10 seconds.

- Remove gas supply probes from the wall terminals.
- Leave Julian connected to line power in order to keep charging the uninterruptible power supply (UPS).
- In case of mains power supply failure, the power switch should always be switched off. Starting up the workstation with the power switch on and the UPS discharged leads to emergency dosage.
- Close backup cylinders.

To switch off the anesthetic gas scavenging system:

- Disconnect gas-disposal-assembly tubing from wall inlet.

NOTE: Julian features a time delayed switch-off. The message

System can be switched on again without loss of data

System is being closed down and switched off

appears for 10 seconds after pressing the main power switch and an audible signal sounds.
During this time, Julian remains in the current operating mode. The switch-off procedure can be canceled immediately by pressing the main power switch again during this time.

The switch-off time delay is not active during the self-test.

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Monitoring

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Selecting the Basic Screens

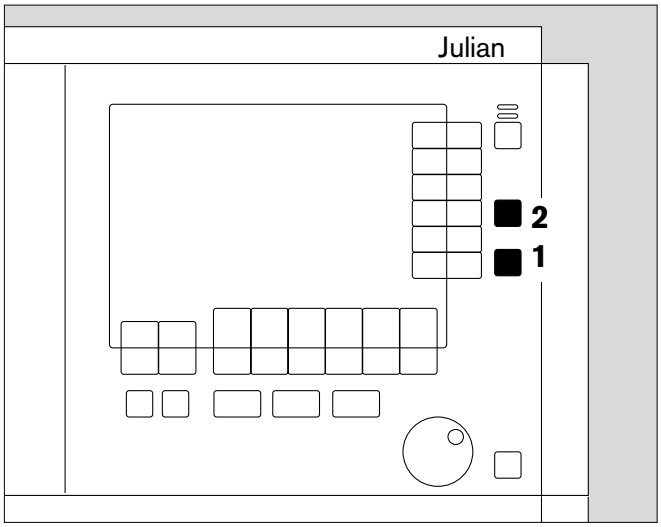
Selecting the Standard Screen Page

The standard screen page is automatically displayed whenever a ventilation mode is started (MAN/SPONT, CMV or PCV). The standard screen page can always be selected during operation:

1 Press key

or

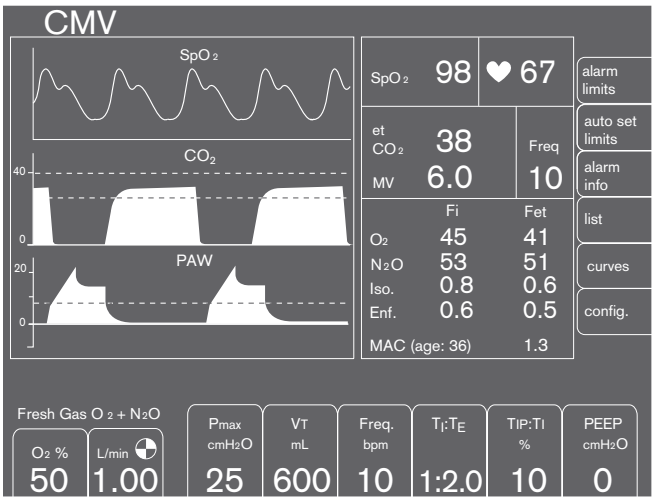
2 Press key several times.



Display (example):

The most important parameters are grouped together on the right-hand side of the screen.

Three waveforms are displayed on the left-hand side (to select other traces, see page 77).



Measured values shown in gray

Julian performs Calibration automatically. The measured values are shown in gray until sufficient data is available and until the sensors have reached their operating temperature.
In this way, Julian indicates that data accuracy is still compromised when compared to the specifications in the "Technical Data" section. The sensors can be calibrated manually for maximum accuracy, see page 85.

When measuring CO_2, anaesthetic agent and N_2O, their numerical values are shown in grey during the warm-up phase whenever the workstation is switched on.

Because the gas measuring module switches off internally in standby mode, calibration is carried out each time the unit is switched on. This is indicated by »**CaI**« in the measured value window.

The display **CAL** appears instead of the numerical value during automatic calibration of a sensor (e.g. O_2 sensor: every 24 hours).

The flow sensor is automatically calibrated as soon as a CO_2 signal is detected by the gas measuring system.
Julian takes account of the respective gas mixture when calculating volumetric values.

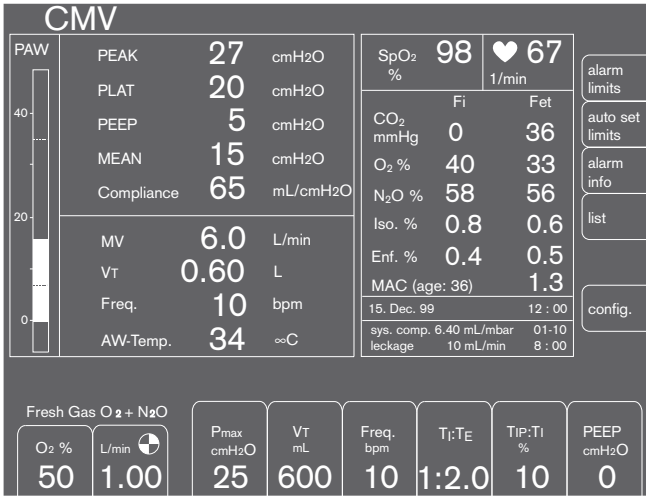
Selecting the Data Screen Page

- Press key several times until the data page appears.

  Display (example):

  Compilation of all numerical values with their units of measurement. The bar graph on the left of the screen shows the change in airway pressure PAW over time. The lines cutting across the bar graph mark upper and lower alarm limits. To set alarm limits for PAW, see page 72.

  The system compliance and leakage are displayed in the right-hand field, together with the time of the last test.



Selecting the Trend Page

Displays a graphical trend of measured values since measurement was started.

Maximum storable time: 8 hours.

The following display combinations can be selected:

– CO_2/MV
– AGas/N_2O
– O_2/compliance
– SpO_2/pulse rate (optional)

NOTE: Lung properties can be monitored continuously with the compliance trend display so that ventilation can be adjusted accordingly. Patient compliance is not measured in SPONT ventilation mode.

- Press (toggle) key several times until the trend screen appears.

  The scaling of the MV and Compliance trend traces depends on the »scale« setting in the configuration menu (pages 78 and 93, Selecting the Scale).

  Scale for MV trend: 0 - 3 (child),
  0 - 15 (adult)
  Scale for compliance trend: 0 - 20 (child),
  0 - 100 (adult)

  Display (example):

  Trend CO_2 and minute volume

Selecting other trend data

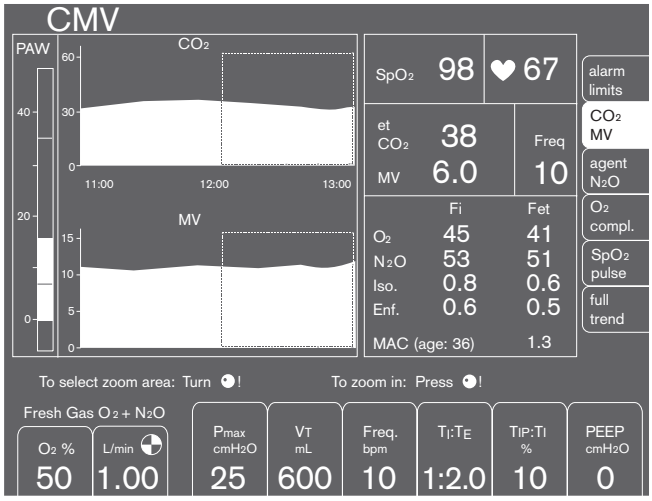
- Press the appropriate menu key:

  »AGas/N_2O« or

  »O_2/compl.« or

  »SpO_2/pulse« (optional)

  The respective menu key will not show if a measuring function is not available.



Zoom function

The trend display can be magnified with the zoom function after 30 minutes of operation.

To select the range:

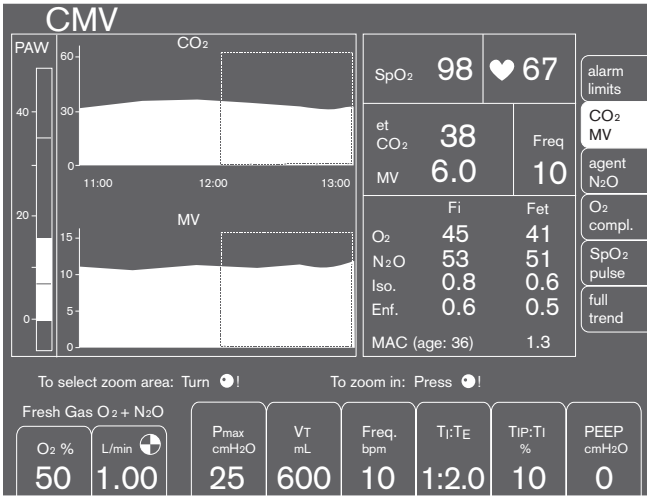
- Turn dial knob and the dashed frames move.

To enlarge the selected area to the full width of the display:

- Press dial knob.
  A new dashed frame appears after a corresponding period of operation and can also be enlarged.

To return to the overall trend:

- Press »**full trend**« menu key and the complete trend will be displayed again.

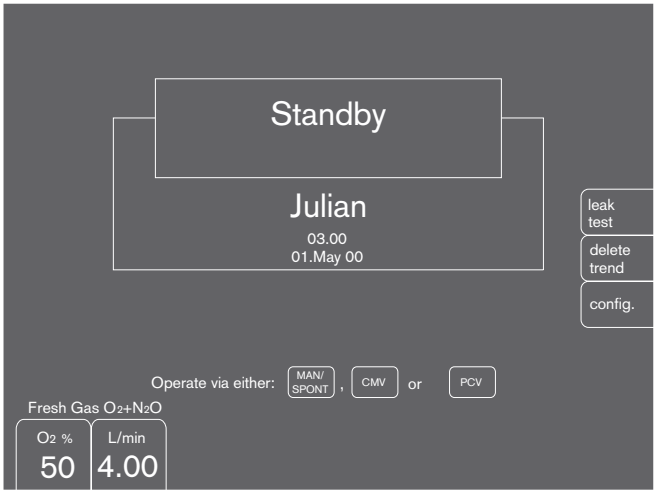


To delete trend memory

NOTE: Deleting the trend memory is possible in standby mode only. The numerical and graphical trend are deleted together!

When in standby mode:

- Press »**delete trend**« menu key.

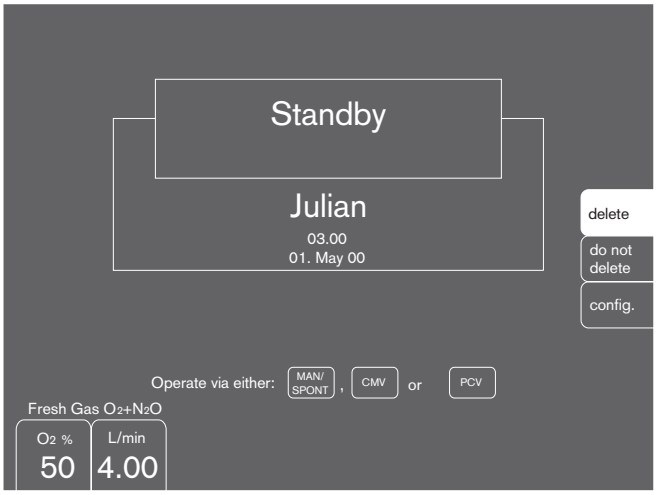


The system asks you to confirm that the trend is really to be deleted.

To delete:

- Press »**delete**« menu key.

NOTE: The stored trend for the anesthetic gas concentration is deleted automatically when a new leading anesthetic agent is detected.



The Alarm System

Alarm messages are assigned to three priority classes by Julian, depending on their urgency, and identified by exclamation marks:

!!! Warning = Category I / High Priority Message
A high priority alarm is a signal which indicates a condition requiring immediate action.

!! Caution = Category II / Medium Priority Message
A medium priority alarm is a signal which indicates a condition requiring prompt action.

! Advisory = Category III / Low Priority Message
A low priority alarm is a signal which indicates a condition that requires operator awareness but not necessarily action.

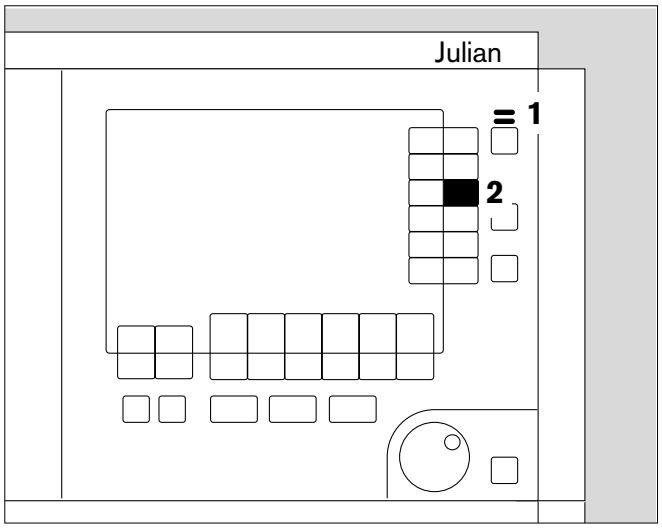
WARNING !

Warning or Caution level audible alarms require immediate operator attention to avert or to prevent development of situations with the possibility of patient injury.

NOTE: If several alarms occur simultaneously, Julian displays the alarm with the highest priority. The others are not displayed.

The alarm lights will start flashing or will light up continuously accompanied by an alarm tone sequence whenever an alarm is displayed.

When an alarm threshold has been violated, the alarm limits menu is opened automatically. The respective alarm limit is highlighted and can be adjusted immediately and /or be confirmed with the dial knob.



Warning:

1 Red light flashes, accompanied by a continuous audible alarm.

Caution:

1 Yellow light flashes, accompanied by an intermittent audible alarm every 30 seconds.

Advisory:

1 Yellow light is lit continuously, accompanied by a single audible alarm.

2 A list of all active Warning, Caution, and Advisory messages, in order of priority, can be displayed by pressing the »**alarm info**« menu key.

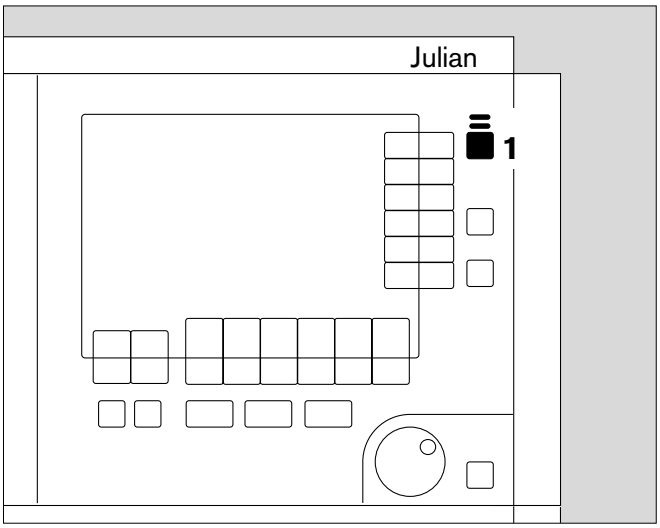
Audible alarms can be silenced for two minutes:

NOTE: A new alarm condition during this period will still be signaled with an audible alarm.

1 Press [🔕] key and its yellow LED will light up.

To reactivate audible alarm:

1 Press [🔕] key and its yellow LED will go out.



WARNING !

The alarm silence button is intended to provide a way of muting audible alarms while corrective action is taken. Failure to identify and correct alarm situations may result in patient injury.

A list of alarm messages can be found on page 122, "Troubleshooting".
CO_2 alarms and SpO_2 alarms are disabled after switching from standby to a ventilation mode. They are automatically activated after the first corresponding signal has been detected.

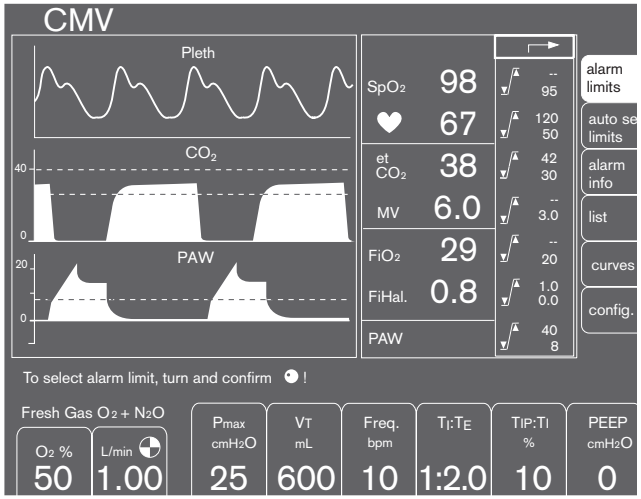
Displaying and Setting Alarm Limits

Alarms can be displayed and set from all three basic screens (standard, data and trend screen) during operation.

The default alarm limits for the ventilation mode are activated automatically when changing from standby to a ventilation mode.

These default alarm limits can be used unchanged or they can be set individually for a patient (see page 98, "Setting Default Alarm Limits").

Individual settings are deleted on changing from a ventilation mode to standby when default alarm limits are reactivated.

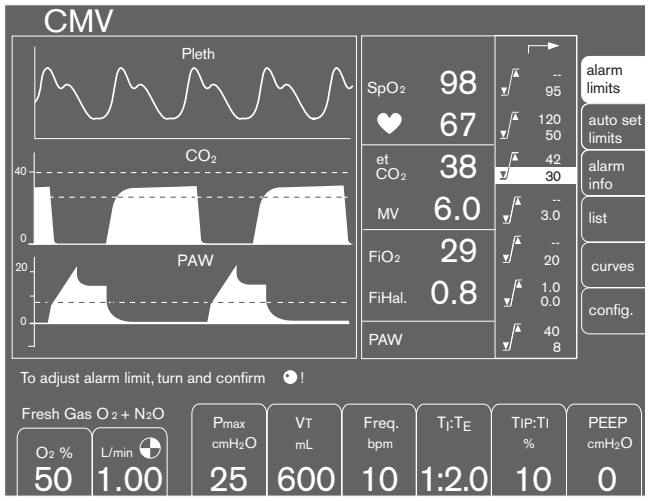


To call up alarm limits:

- Press the menu key »**alarm limits**«.

Display (example):

Measured values and their alarm limits are shown on the right-hand side.
Waveforms with alarm limits represented by dashed lines are shown on the left.



Example $EtCO_2$:
Upper alarm limit (42 mmHg) and lower alarm limit (30 mmHg) are shown alongside the measured value (38 mmHg).

A disabled alarm limit is indicated by two dashes (– –).

Disabled CO_2 alarms are indicated by a 🔕 symbol in the measurement field.

If only the $etCO_2$ HIGH alarm or the $FiCO_2$ HIGH alarm are disabled (in the alarm limit menu), this is indicated by a symbol in the measurement field.

If APNEA FLOW alarm and MV LOW alarm are disabled, a 🔕 symbol is displayed in the measurement field.
If only the MV LOW alarm is disabled, this is indicated by a symbol.

To set an alarm limit:

- Place cursor bar on the alarm limit by turning dial knob, press to confirm.
  The alarm limit is highlighted.
- Set a new value by turning dial knob,
  press to confirm.
  The new alarm limit is now effective. The cursor bar returns to the ↦ symbol.

For adjustment range of the alarm limits, see table to the right:

Alarm limits	Adjustment range
SpO_2 [%]	51 to 100 50 to 99
Pulse ♥ [1/min]	31 to 300 20 to 299
$EtCO_2$ [mmHg]	1 to 75 0 to 74
$FiCO_2$ [mmHg]	0 to 10 – –
MV [L/min]	0.1 to 39 0 to 38.9
FiO_2 [Vol.%]	19 to 100 18 to 99
Fi Hal. [Vol.%]	0.1 to 7 0 to 6.9
Fi Iso. [Vol.%]	0.1 to 7 0 to 6.9
Fi Enf. [Vol.%]	0.1 to 7 0 to 6.9
Fi Des. [Vol.%]	0.1 to 21.9 0 to 21.8
Fi Sev. [Vol.%]	0.1 to 9.9 0 to 9.8
PAW [cmH_2O]	5 to 98 4 to 35

To quit the **alarm limits** menu:

- Press the dial knob,
  or
- press the key.

Adapting limits – AutoSet

When the ventilation settings have been made, Julian can automatically adapt the alarm limits for the minute volume (MV) and airway pressure (PAW) to the current ventilation settings in CMV mode.

- Press the softkey »**auto set limits**«. The alarm limits menu opens automatically.

  The alarm limits for MV and PAW are adapted. At the same time, an advisory message is displayed: "**MV and PAW limits have been automatically adapted**". The menu closes again automatically after 5 seconds.

  The new alarm limits for the set MV are calculated by Julian as follows:

	Upper alarm limit	Lower alarm limit
MV [L/min]	Measured MV · 1,4 At least 2,0	Measured MV · 0,6 At least 0,5

Julian calculates the new PAW alarm limits by determining PEAK, $P_{Plateau}$ and PEEP by two different methods and selecting the higher value as the "measured value".

Method 1:
The mean of the last 4 measured breaths. If fewer measured values are available, these are used as the basis of determination.

Method 2:
The measured value of the last breath.

Julian sets the upper alarm limit for PAW to the absolute higher determined measured value of

– PEAK + 5 mbar or
– $P_{Plateau}$ + 10 mbar, but at not less than 10 mbar in CMV/PCV.

Julian sets the lower alarm limit for PAW from the determined measured values to

– PEEP + 0,6 · ($P_{Plateau}$ – PEEP),

and not less than 4 mbar in CMV/PCV.

To reset individual alarm limits for MV and PAW:

- See "Displaying and setting alarm limits" on page 70.

To reuse all default alarm limits:

- See "Configuring in standby mode, setting default alarm limits" on page 98.

CO_2 Alarms On/Off

The alarm limits for $EtCO_2$, insp. CO_2 and CO_2 apnea monitoring can be switched off with the menu key »**CO2-al. on/off**« in MAN/SPONT mode.

In this case, the **CO_2** 🔔 symbol appears alongside the measured endexpiratory CO_2 concentration.

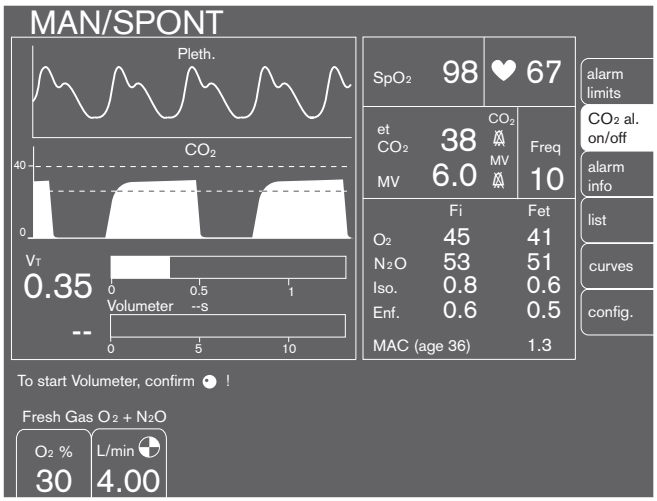
The CO_2 alarm limits are reactivated by pressing the menu key again. The disabled CO_2 alarm limits are reactivated automatically when changing to a different ventilation mode.

The CO_2 alarm limits can also be enabled and disabled under "Alarm limits" in the configuration screen in all ventilation modes, see page 81.

Disabled CO_2 alarms are indicated by a 🔔 symbol in the measurement field.

If only the $etCO_2$ HIGH alarm or the $FiCO_2$ HIGH alarm are disabled (in the alarm limit menu), this is indicated by a 🔔 symbol in the measurement field.

The $etCO_2$ 🔔 and $FiCO_2$ 🔔 alarms can be configured »ON« or »OFF« in standby mode for the transition from automatic ventilation. When the alarm limits are set to »ON«, the value is transfered from automatic ventilation mode.



Alarm Info

This function is used to list all active alarms in order of priority.

- Press and hold »**alarm info**« menu key.

Display (example):

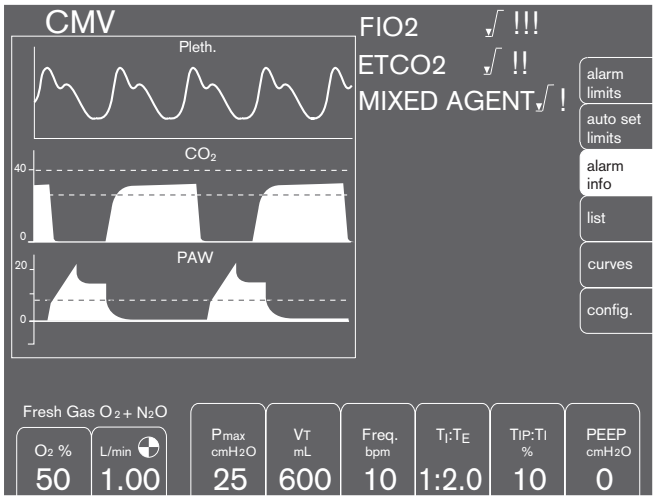
Active WARNING level alarm:
FIO2 🔔 !!!

Active CAUTION-level alarm:
ETCO2 🔔 !!

Active ADVISORY-level alarm:
MIXED AGENT !

The display only remains visible as long as the menu key is pressed.

Up to 8 alarms can be displayed simultaneously.

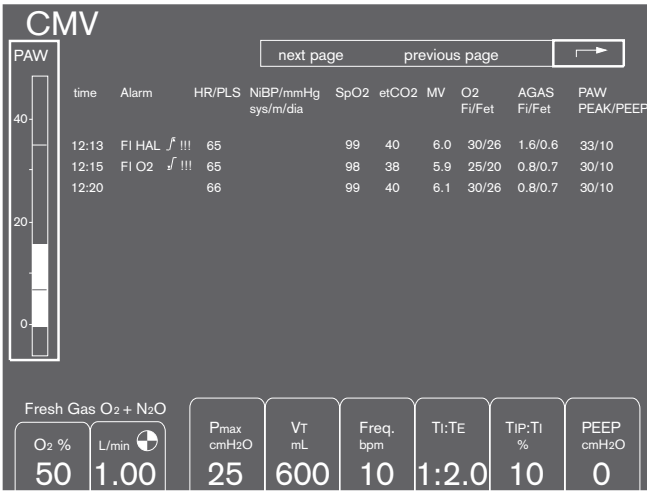


Numerical Trend (List)

Record of measured values, alarms and change of ventilation modes to facilitate anesthesia record-keeping.
The control criteria for entries can be configured, see "Record" on page 80.

- Press menu key »**list**«.

Display (example):


CMV
PAW
40
20
0
next page
previous page
time Alarm HR/PLS NiBP/mmHg sys/m/dia SpO2 etCO2 MV O2 Fi/Fet AGAS Fi/Fet PAW PEAK/PEEP
12:13 FI HAL !!! 65 99 40 6.0 30/26 1.6/0.6 33/10
12:15 FI O2 !!! 65 98 38 5.9 25/20 0.8/0.7 30/10
12:20 66 99 40 6.1 30/26 0.8/0.7 30/10
Fresh Gas O2 + N2O
O2 % 50
L/min 1.00
Pmax cmH2O 25
VT mL 600
Freq. bpm 10
TI:TE 1:2.0
TIP:TI % 10
PEEP cmH2O 0

To "open" the previous page of numerical trend:

- Select »**previous page**« by turning dial knob, press to confirm.

To "open" the next page of numerical trend:

- Select »**next page**« by turning dial knob, press to confirm.

To return to the standard screen:

- Place cursor on the ↱ symbol by turning dial knob, press to confirm.

or

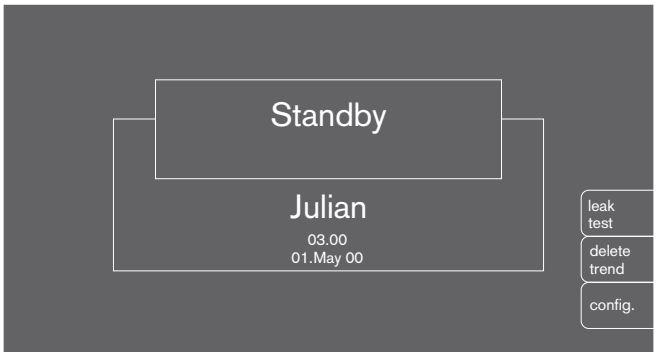
- Press key.

Delete trend and list

NOTE: Deleting the trend memory is possible in standby mode only. The numerical and graphical trend are deleted together!

When in standby:

- Press »**delete trend**« menu key.



Delete trends and list:

- Press »**delete trend**« menu key.

The system asks to confirm that the trend is really to be deleted.

To delete:

- Press »**delete**« menu key.

NOTE: The stored trend for the anesthetic gas concentration is deleted automatically when a new leading anesthetic agent is detected.

Selecting Waveforms

NOTE: Selecting waveforms is only possible from the standard screen!

This menu allows the user to select and position three waveforms (curves) for the current ventilation mode.

The following curves can be selected:

AGas	anesthetic agent concentration at the Y-piece
CO2	CO_2 concentration at the Y-piece
Flow	expiratory flow
O2	O_2 concentration at the Y-piece
PAW	airway pressure
Pleth	plethysmogram (optional)

Instead of curves, the following display sets can be selected:

blank	blank field
Volumeter	a display mode showing the minute volume and tidal volume V_T as numeric display and bar graphs
Pressures	numeric display of measured values for P_{PEAK}, P_{PLAT}, P_{MEAN} and PEEP
FG/volu	Volumeter in combination with bar display of fresh gas flow in L/min for O_2 and N_2O or AIR (virtual flow tubes)
FG/press	Pressures in combination with bar display of fresh gas flow in L/min for O_2 and N_2O or AIR (virtual flow tubes)

- Press »**curves**« menu key.

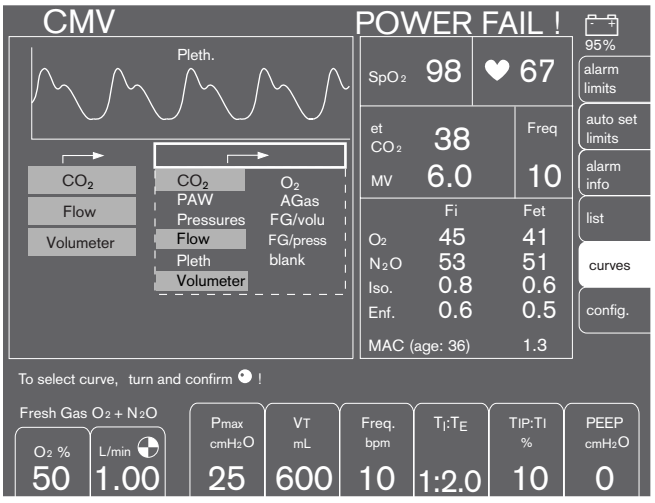
  Display (example):
  The name of the curves or display set in each field is displayed together with the choice of possible parameters. The current curves and sets are highlighted by a gray background.

  Example: To replace the waveform for PAW by the volumeter set:

- Turn dial knob to select the desired display set (»**volumeter**«), press to confirm.

  Your choice now appears against a white background.

  The cursor jumps to the ↦symbol of the positioning menu.



- Select the desired position with the dial knob and press to confirm.

  Display (example):

  The waveform is replaced and the cursor returns to the ⮡ symbol in the selection menu.

  To return to the standard page:

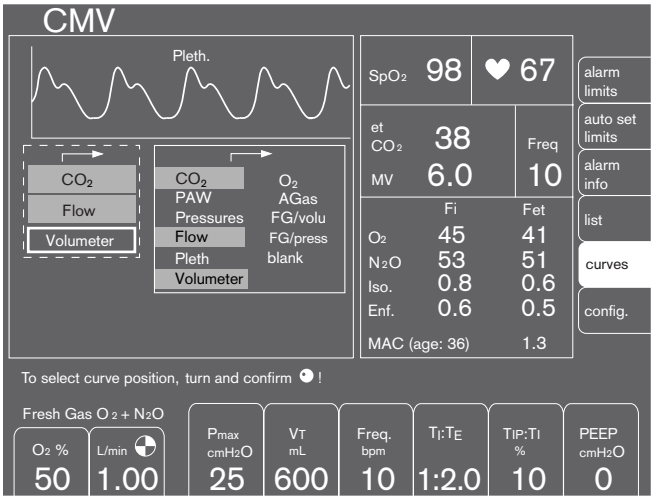
- Press the dial knob,

  or

- press the key.

  If a waveform field shall remain blank:

- Select »**blank**« with the dial knob and press to confirm.



Using the Volumeter Function

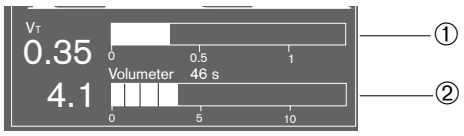
To observe and assess ventilation in manual and pressure controlled ventilation modes and during spontaneous breathing.

① Upper bar:
Current tidal volume (VT), preceded by its numerical value.

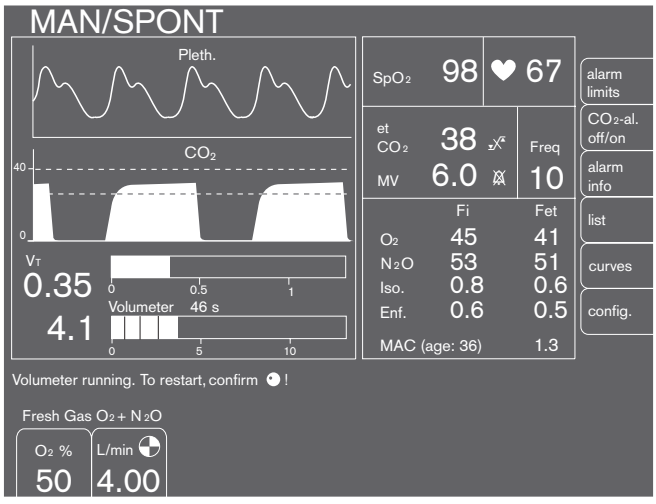
The bar graph shows generation of VT

② Lower bar:
Volumeter (minute volume measurement) with a mark between each breath, preceded by its numerical value.

The scale of the bar display depends on the default setting, see "Configuring During Operation, Selecting the scale" on page 78 and "Configuring in Standby Mode, selecting the scale" on page 93.



Setting	Tidal volume VT in L	Minute volume MV L/min
Scale for infants and small children	0.2	2
Scale for adults	1.0	10



Starting the volumeter

- Press dial knob.
  Values are deleted and volumeter is restarted if the dial knob is pressed again before 60 seconds have elapsed.

  Time elapsed in seconds is displayed above the bar with the integrated volume on the left. Individual breaths are separated by segments in the bar. The volumeter stops automatically with an acoustic signal after 60 seconds.
  Measured values are displayed for 4 minutes and then disappear.

Display combination with flow tubes

See »**Selecting curves**« for selection of display combinations.

Possible combinations:

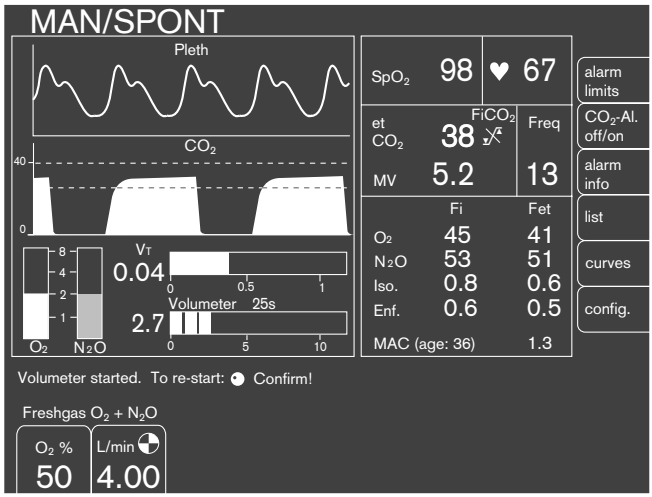
– »**FG/volu**« or

– »**FG/press**«

The fresh gas flow in L/min (O_2, N_2O or AIR) is displayed in the flow tubes.

Display (example):

- »**Start volumeter**«, see »**Using the volumeter function**«, page 65.



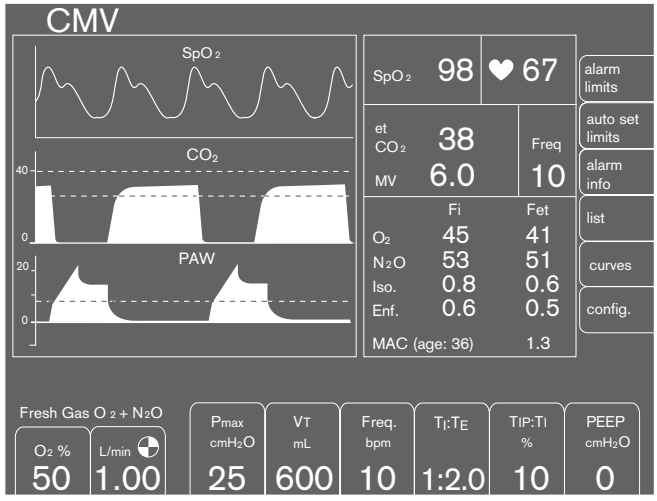
Configuring During Operation

Configuration menus are used to select or modify individual monitoring functions for measurements in progress.

NOTE: When switching to Standby, audible alarms and alarm limits are reset to their default values. Disabled alarms (CO_2 alarms, SpO_2 alarms, HLM-related alarms) are enabled again. The actual anesthetic agent selection settings, pulse tone settings (optional) and settings in the parameter menu remain valid until Julian is switched off.

From standard screen (example) or data screen:

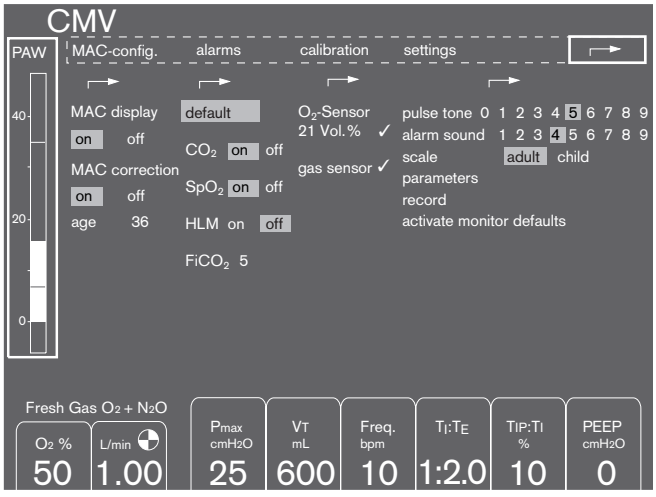
- Press »**config.**« menu key.



Display (example):

Menu keys for fresh gas and ventilation parameters remain active.

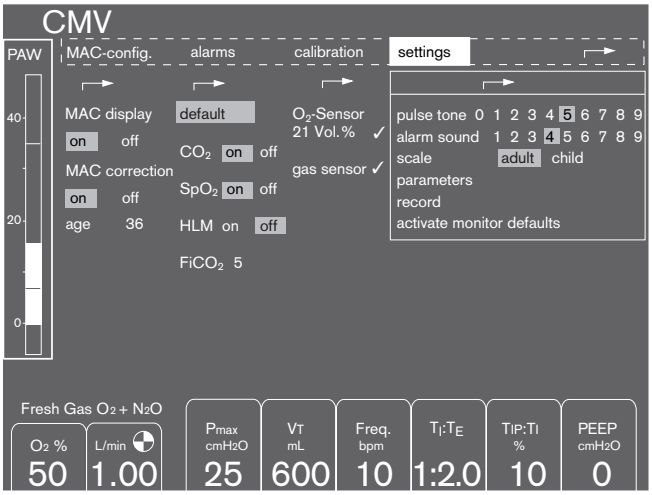
Values highlighted in gray represent current settings.



Setting Monitoring Functions

- Select »**settings**« column by turning dial knob, press to confirm.

  Display (example):



Setting volume of the pulse tone

0 = off
9 = maximum volume

- Select the line »**pulse tone**« by turning dial knob, press to confirm. The cursor automatically jumps to the last value selected (example: 5).
- Adjust value with dial knob, press to confirm.

Setting audible alarm volume

1 = minimum volume
9 = maximum volume

- Select the line »**alarm sound**« by turning dial knob, press to confirm. The cursor automatically jumps to the last value selected (example: 4).
- Adjust value with dial knob, press to confirm.

WARNING !

Always set audible alarm volume to a level that is sufficiently loud with respect to the general noise level of the surroundings.

NOTE: Local standards require a volume of at least 45 dB(A) for audible alarms. Therefore, settings 1 through 4 are configured to deliver this audio level.

Selecting the scale

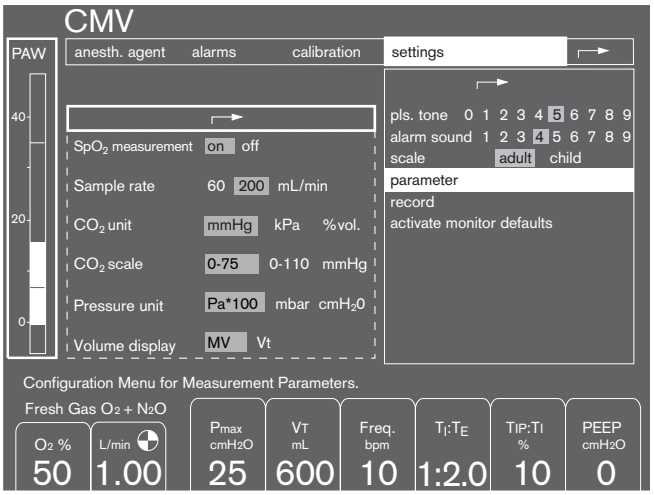
For scaling volumeter function and trend trace.

- Select the line »**scale**« with dial knob, press to confirm.
- Select »**adult**« or »**child**« with dial knob, press to confirm.

Setting the measuring parameters

- Select the line »**parameters**« with dial knob, press to confirm.
  The »**parameters**« menu appears in the left-hand field.

  Display (example):



  Switch SpO_2 measurement (optional) on/off:

- Select the line »**SpO_2 measurement**« with dial knob, press to confirm.
- Select »**on**« or »**off**« with dial knob, press to confirm.

  Select sample rate for gas measurement:

- Select the line »**sample rate**« with dial knob, press to confirm.
- Select »**60**« or »**200 mL/min**« with dial knob, press to confirm.

Recommendation: select 200 mL/min.

  Select CO_2 units of measurement:

- Select the line »**CO_2 unit**« with dial knob, press to confirm. The last value selected is highlighted by a gray background.
- Select desired units of measurement by turning dial knob, press to confirm.

  Setting pressure unit:

- Select the line »**Pressure unit**« by turning the rotary knob and press to confirm.
- Select »**Pa*100**« or »**mbar**« or »**cmH_2O**« by turning the rotary knob and press to confirm.

  Setting flow display:

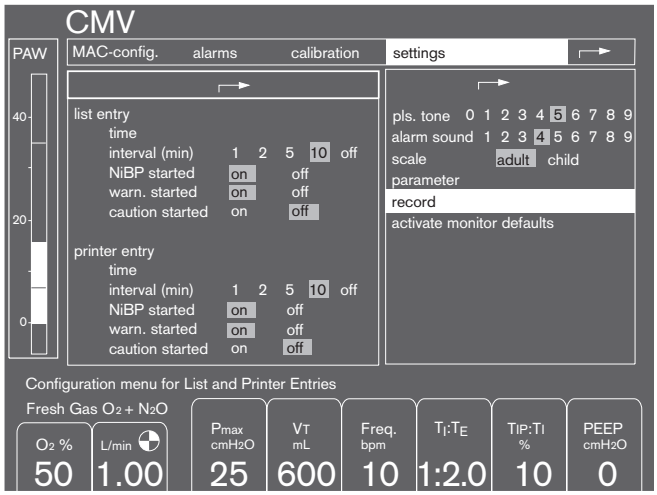
- Select the line »**Flow display**« by turning the rotary knob and press to confirm.
- Select »**MV**« or »**Vt**« by turning the rotary knob and press to confirm. The selected parameter is displayed on the standard page. Vt alarm limits are not monitored. The alarm limits set for MV continue to be monitored in operation.

Record

This function is used to determine the type of event that triggers an entry in the numerical trend or an online printout on the connected logging printer.

- Select the line »**record**« with dial knob, press to confirm.
  The »**record**« menu appears on the left-hand side.

  Display (example):



  Time interval-started **(min)**
  A list entry is activated after a fixed time interval in minutes.

  NiBP-started
  An entry is made after every NiBP measurement with new measured values. These values are read from an external monitor which is connected to Julian via MEDIBUS interface.
  If no Dräger NiBP monitor is connected, no NiBP entries will be activated.

  warning-started
  An entry is made whenever a Warning message is triggered.

  caution-started
  An entry is made whenever a Caution message is triggered.

- Turn dial knob to select event triggering of entries, press to confirm.

Activating monitor defaults

This function is used to activate the default monitoring settings configured in standby mode which are active whenever the system is switched on.

Alarm limits are not affected and remain at their current settings.

- Select the line »**activate monitor defaults**« with dial knob, press to confirm, see page 92, "Setting Default Values".

Configuring Alarms

- Turn dial knob to select the column »**alarms**«, press to confirm.

Default

This function is used to activate default alarm limits set in the standby configuration which are effective whenever the system is switched to standby.

Setting default alarm limits:

- Turn dial knob to select »**defaults**« menu, press to confirm.
  Please refer to page 96 for adjusting default limits.

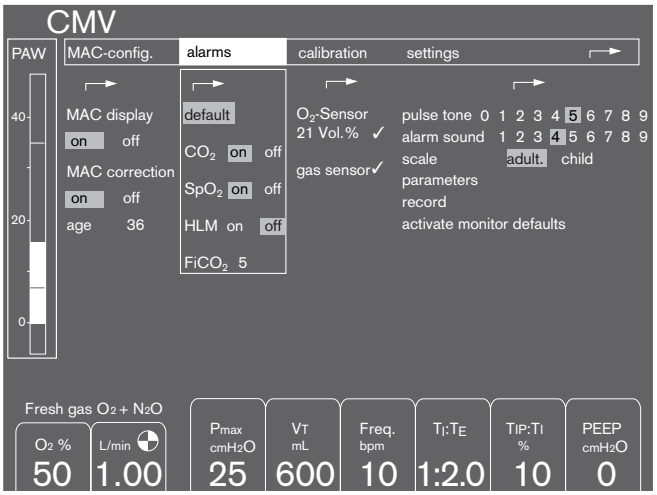
CO_2 alarms on/off

To enable/disable all CO_2 alarms, including the apnea alarm.

- Turn dial knob to select »**CO_2 on**« or »**CO_2 off**«, press to confirm.

  Disabled CO_2 alarms are indicated by a 🔔 symbol in the measurement field.

  If only the etCO_2 HIGH alarm or the FiCO_2 HIGH alarm are disabled (in the alarm limit menu), this is indicated by a 🔕 symbol in the measurement field.



SpO_2 alarms on/off

To enable/disable all SpO_2 alarms (optional).

- Turn dial knob to select »**SpO_2 on**« or »**SpO_2 off**«, press to confirm.

  Disabled SpO_2 alarms (except **SPO2 SEN Disc** and **SPO2 ERR**) are indicated by the 🔕 symbol in the measurement field.

  Deactivated alarms are indicated by the symbol 🔕 in the measurement field with a corresponding message.
  If all the alarms for this measured value are deactivated, this is indicated by the symbol 🔕 and a corresponding message.

Alarm mode for heart-lung machine (HLM)

During use of an Heart Lung Machine (HLM) the lung ventilation leads to untypical CO_2 waveforms. Thus no breathing phases will be detected based on the CO_2 signal. This causes apnea alarms.

Due to continuous blood flow during HLM surgery the SpO_2 alarms of Julian are disabled in this mode. All other alarms remain active.

In HLM alarm mode:

– all apnea alarms are disabled.

– PAW lower alarm limit disappears from the alarm limit menu.

– gas concentrations are measured continuously regardless of the respiratory phase.

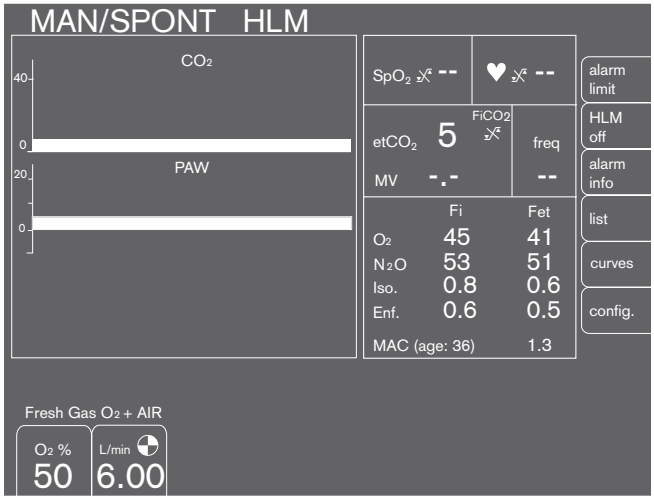
– SpO_2 alarms are disabled. They are reactivated automatically when pulsations are again detected by the system after switching off HLM alarm mode.

The HLM mode of Julian is dependent on the alarm system or functionality of the connected HLM machine and is not intended to replace any monitoring or alarms of the HLM machine.

Selecting HLM alarm mode

- Press »**config**« menu key.
- Turn dial knob to select the column »**alarms**«, press to confirm.
- Turn dial knob to select the line »**HLM on**«, press to confirm.

- Display (example):



The lung is kept open with constant airway pressure.

HLM mode is deactivated automatically when entering **Standby**.

HLM alarm mode can be switched off at any time:

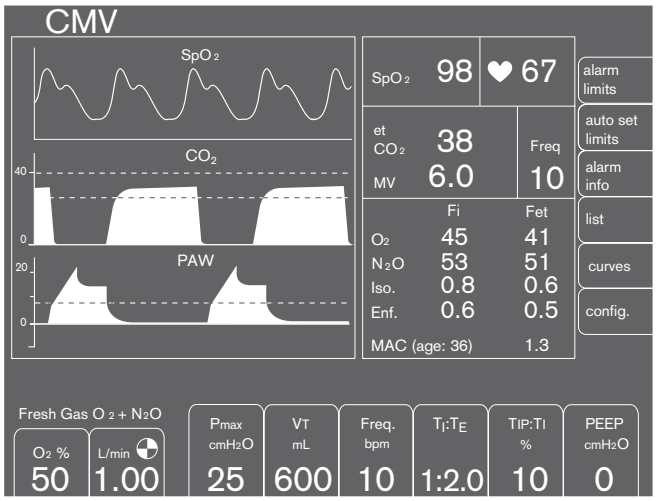
- Press »**HLM off**« menu key.

When leaving HLM mode:

– CO_2 apnea detection will be activated immediately (no sleep mode function).

– SpO_2 measurement remains in sleep mode (alarms are reactivated when pulsation is detected).

MAC configuration



Anesthetic agent identification and display

Julian automatically identifies the anesthetic agent used and adjusts the measurement and monitoring of the anesthetic gas concentration to suit the gas identified.

If there is a mixture of two volatile anesthetic agents, the concentration of the secondary anesthetic agent is displayed from a MAC value of 0.1 MAC upwards. The gas with the higher expiratory MAC value is displayed above the secondary gas.

A secondary anesthetic agent becomes the main anesthetic agent if its MAC value exceeds the MAC value of the main anesthetic agent by 0.2 MAC.

A mixture of more than 2 volatile anesthetic agents cannot be reliably detected.

Calculating the MAC values

Julian calculates the MAC value (Minimum Alveolar Concentration) from the linear total of volatile anesthetic agents measured and N_2O. The measured values used are the end-expiratory concentrations. Partial pressures are taken into account.

Age-corrected MAC values are calculated according to W. W. Mapleson, British Journal of anesthesia 1996, pp. 179-185.

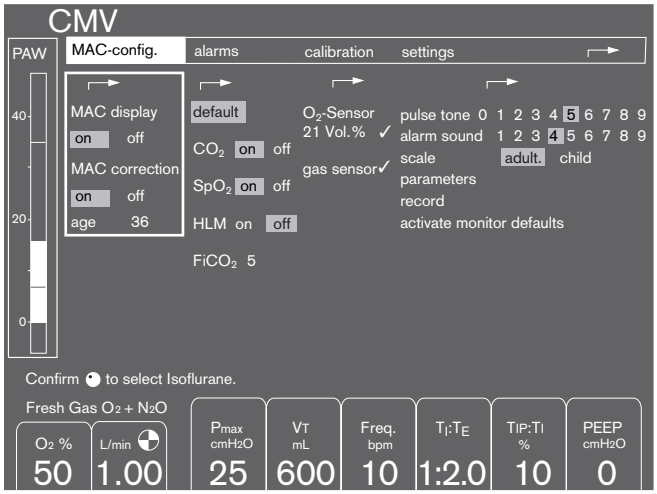
Displaying MAC

To activate the MAC display:

- Select column »**MAC config.**« by turning the rotary knob and press to confirm.
- Select »**MAC display**« by turning the rotary knob and press to confirm.
- Select »**on**« by turning the rotary knob and press to confirm.

To select the age correction for the MAC display:

- Select »**MAC correction**« by turning the rotary knob and press to confirm.
- Select »**on**« by turning rotary knob and press to confirm.

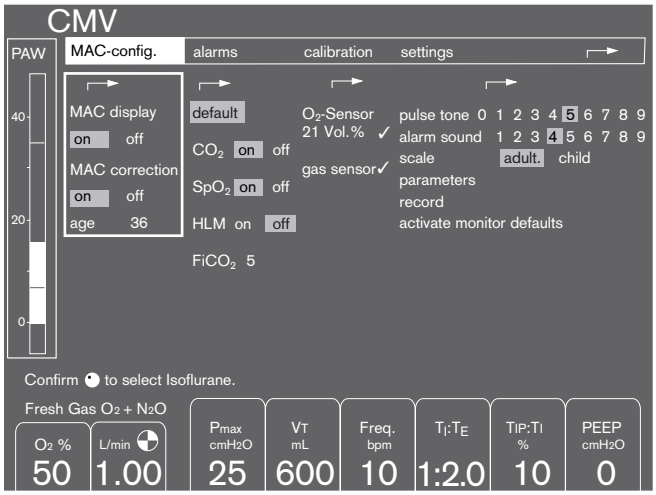


To select the patient's age:

- Select line »**age**« by turning the rotary knob and press to confirm.
- Set age by turning the rotary knob and press to confirm.

If the MAC display is configured to »**off**«, the »**MAC correction**« and »**age**« lines are automatically dimmed.

If MAC correction is configured to »**off**«, the »**age**« line is automatically dimmed.

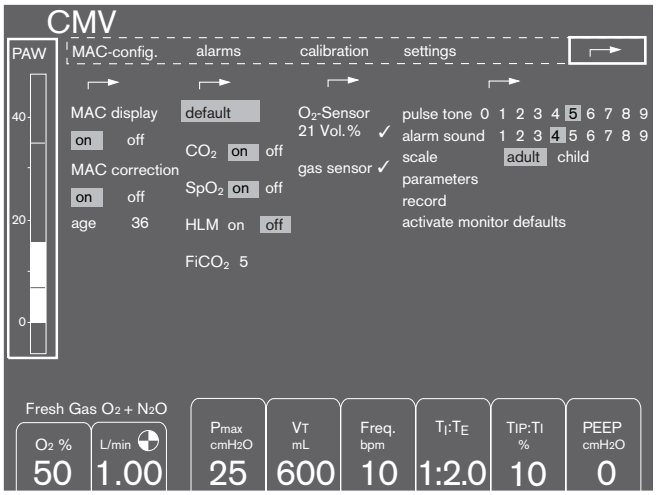


MAC-Definition:

1 MAC is equal to the anesthetic gas concentration at which 50% of all patients no longer respond to a stimulation of the nerves.
The influence of other medication(opiates or intravenous hypnotics) is not taken into consideration when calculating MAC values.

Manual Calibration

Julian calibrates its sensors automatically during operation. The message **CAL** appears instead of the current measured value during a calibration process. Calibration of the O_2 sensor and zero calibration of the other gas sensors can be repeated manually, for instance if automatic calibration was unsuccessful.

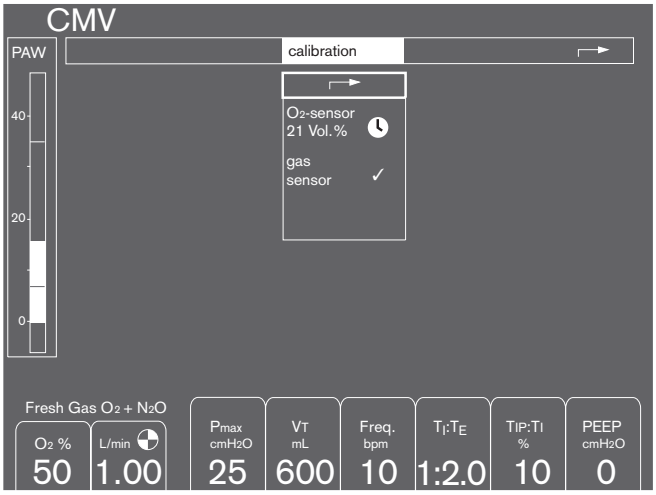


- Turn dial knob to select the »**calibration**« column, press to confirm.
- Select and confirm the appropriate line with dial knob, for example:
  »**O2-Sensor**
  21 vol.%«

The calibration process is started as soon as the selection is confirmed. The clock symbol ◷ appears at the end of the respective line, indicating that calibration is in progress.

When calibration is complete, a check mark (✓) appears instead of the clock symbol. A question mark (**?**) indicates that calibration must be repeated because the previous calibration attempt was not successful.

Other settings can already be made during calibration.



SpO2 Measurement
(Available Option)

Sensor Selection

WARNING !

Use only original Nellcor SpO2 sensors.

Follow Instructions for Use of the sensors – incorrect positioning or use can cause tissue damage.

Select sensor according to the following criteria:

- Patient weight
- Patient mobility
- Possible application site
- Patient perfusion
- Duration of use

The following table lists the specific sensor types available and their characteristics. It is intended as an aid for selection.

Sensor type	OXISENSOR™ I-20	OXISENSOR™ D-20	OXISENSOR™ DS-100 A	OXISENSOR™ D-25	OXISENSOR™ R-15
Age group	Infants	Children	Adults	Adults	Adults
Patient weight	1 to 20 kg	10 to 50 kg	>40 kg	>30 kg	>50 kg
Period of use	Short and long-term monitoring	Short and long-term monitoring	Short-term monitoring	Short and long-term monitoring	Short and long-term monitoring
Patient mobility	Limited activity	Limited activity	Inactive patients only	Limited activity	Inactive patients only
Preferred measuring point	Toe	Finger	Finger	Finger	Nose
Sterility[1)]	Sterile-packed	Sterile-packed	____	Sterile-packed	Sterile-packed

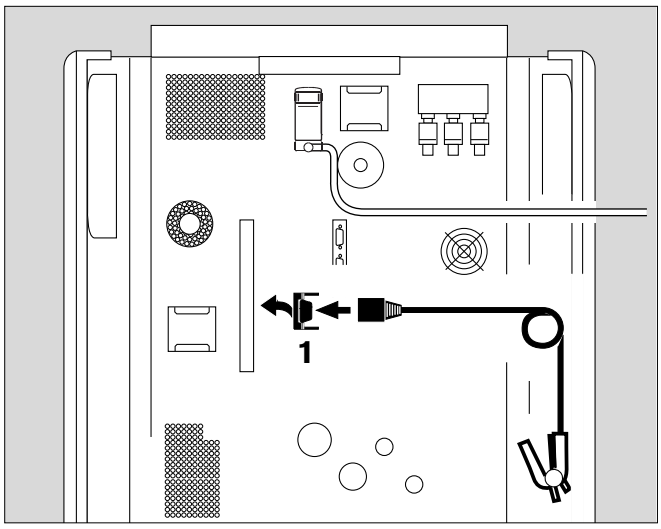
1) in unopened, undamaged packaging

- Select appropriate sensor.

On the back of the Julian Workstation:

1 Swing protective socket cover to the left and insert sensor plug.

Swing protected socket cover back to fix sensor plug.



C-lock-ECG Synchronization (Optional)

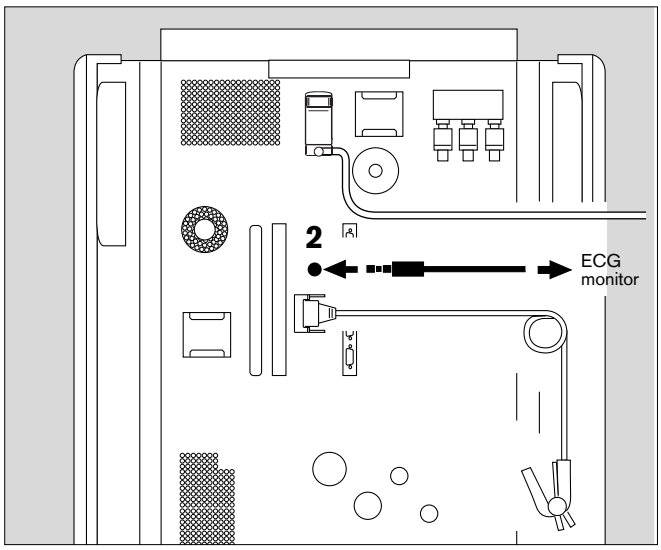
If a patient is highly agitated or arterial flow is very low, signals obtained from SpO2 measurements can be improved using C-Lock-ECG synchronization. In this case, Julian receives two separate signals that render information on heart activity:

– An optical signal from the SpO2 sensor

and

– an electrical signal from the separate ECG monitor.

Julian uses the R-wave of the ECG signal to identify the pulse and to synchronize SpO2 measurement with this signal.



2 Route ECG signal from an ECG monitor with cable and plug to the back of the Julian. See "Technical data" on page 143 for compatibility of electrical signal and pin assignment.

In the event of a delayed ECG signal

Synchronization may be impaired if the ECG signal is delayed by more than 40 milliseconds with respect to the real time QRS complex.

If you suspect a problem of this kind:

- Use Julian without C-Lock-ECG synchronization.

Tips to Prevent Artifacts

Only use Nellcor-compatible sensors in the recommended positions, otherwise incorrect measurements and tissue damage may result.

Damaged sensors with exposed electrical contacts must not be used – danger of electric shock.

Used adhesive strips of the Oxiband-OXI-A/N and OXI-P/I sensor must not be reused, as they may not adhere properly.
The sensor strips must not be stretched unduly.
Never use two strips together, as this may lead to venous pulsation and failure of the pulse signal.

High intrathoracic pressure, pressure on the thorax and other consecutive impairments of the venous flow can lead to venous pulsation with consequent failure of the pulse signal.

The pulse signal may fail in the presence of shock, low blood pressure, severe vasoconstriction, major anemia, hypothermia, arterial occlusion proximal to the sensor, and asystolia.

The sensor must be protected from exposure to bright light (e.g. surgical lamps and direct sunlight), otherwise the pulse signal may fail or inaccurate results may be obtained.

The sensor should not be positioned on limbs together with an arterial catheter, blood pressure cuff or intravascular venous infusion, otherwise the pulse signal may fail and measurement become inaccurate.

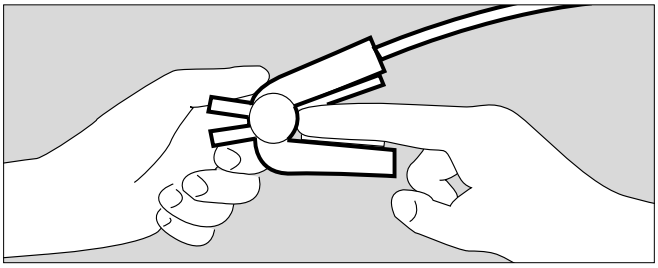
Measurement accuracy may be reduced in the presence of significant concentrations of dysfunctional hemoglobins, such as carboxyhemoglobin or methemoglobin.

Intravascular dyes, such as methylene blue, may also impair measurement accuracy.

Electrosurgery can impair the measuring accuracy; the cable and sensor should therefore be positioned as far away as possible from the site of electrosurgery and its neutral electrode.

Sensor performance may be impaired and lead to inaccurate results if the patient moves excessively. The sensor should be applied to a different site in such cases in order to reduce the risk of artefacts due to movement.

Applying the Durasensor DS-100 A



Reusable sensor for short-term monitoring of relatively immobile patients weighing over 40 kg.

The sensor is preferably positioned on the index finger, although other fingers can also be used. The little finger should be used if the patient is particularly large or obese.

- Open the clip slightly and slide the sensor onto the finger. The tip of the finger must touch the end and the soft padding should rest on the nail and tip of the finger. The lead should be on top of the finger.
- Ensure that the finger is not squeezed or hurt by the clip.
- Change the application site at least every 4 hours in order to avoid impairing blood circulation.

Follow specific Instructions for Use when using other Nellcor sensors!

Airway Temperature Monitoring
(Available Option)

Required parts

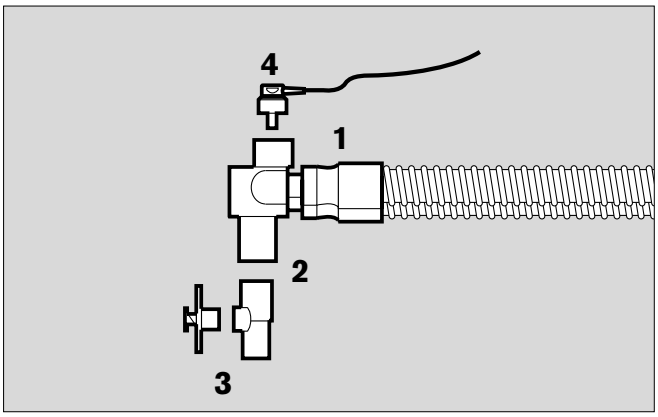
- Temperature sensor 84 05 371,
- Y-piece with temperature sensor receptacle M 30 543
- T-piece 86 00 224
- Filter 86 00 225

1 Connect Y-piece with temperature sensor receptacle to breathing circuit.

2 Plug T-piece into the Y-piece.

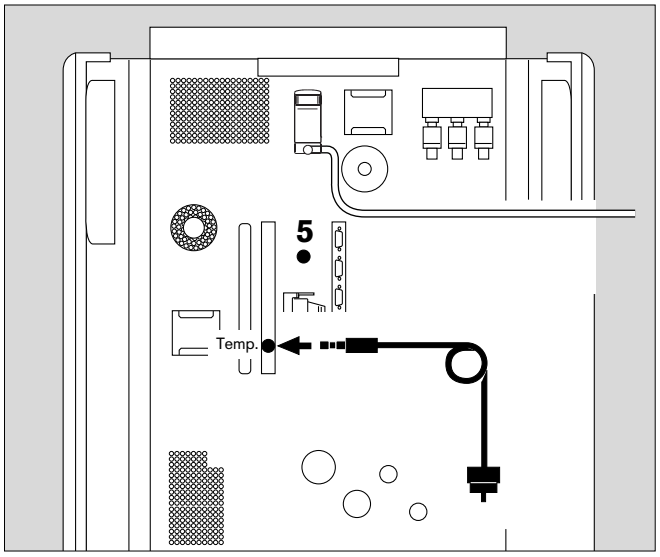
3 Plug filter with luer-lock adapter for gas sampling line into the T-piece.

4 Connect temperature sensor to the Y-piece.



5 Connect temperature sensor into the temperature socket on the interface panel in the back of the anesthesia workstation.

Airway temperature is now displayed on the data screen



Configuring in Standby Mode

Contents

Setting Default Values..... 92
Setting Volume of the Pulse Tone (Optional)..... 93
Setting Audible Alarm Volume..... 93
Selecting the Scale..... 93
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MAC configuration..... 103
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The default settings for monitoring functions, as well as fresh gas and ventilation parameters can be configured in standby mode. Default settings for the monitoring functions (pulse tone, scale, parameters, record, interface, and traces) are in effect after the system is switched on.

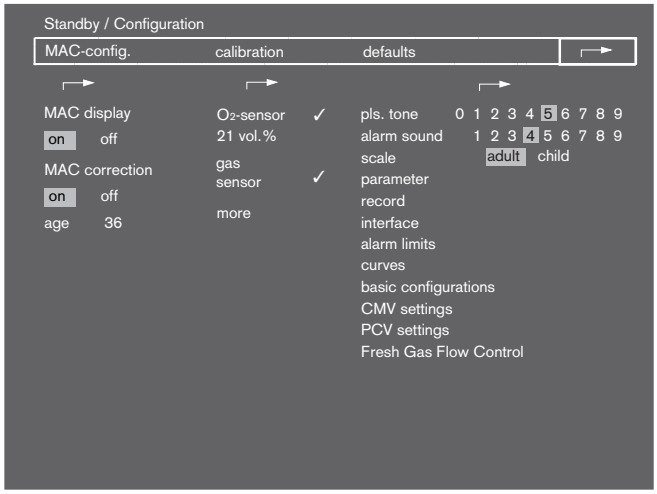
The default values for alarm limits, fresh gas parameters and ventilation parameters are in effect after each standby.

The basic configurations (language, time, date, and tone sequence) remain until their next modification.

After switching the system on, the selection of anesthetic agent is always set to "auto".

- Switch Julian to standby mode.
- Press »**config.**« menu key.

Display (example):



The following settings can be made in the menu:

– **Default settings**
– **Calibration**
– **Anesth. agent**

Fields highlighted by a gray background indicate settings currently in effect.

The ⮌ symbol indicates a return to the previous menu level.

- Select, set and confirm new settings with dial knob.

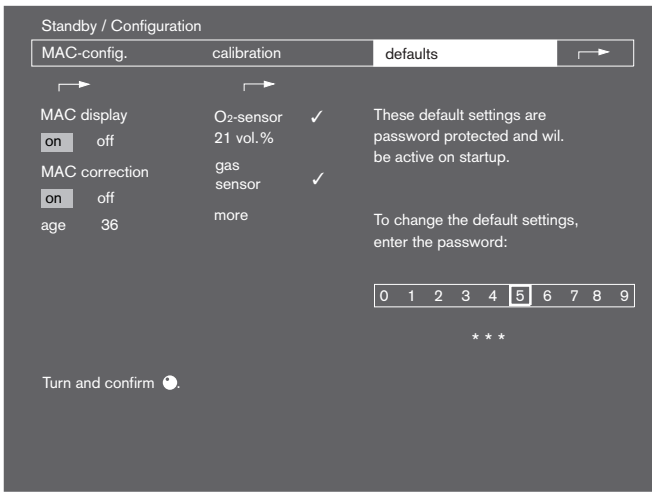
Setting Default Values

Default values are in effect after the system is switched on. Default monitoring settings can be activated during operation with **»activate monitor defaults«**,
see "Activating monitor defaults" on page 80.

- Select and confirm **default settings** with dial knob.

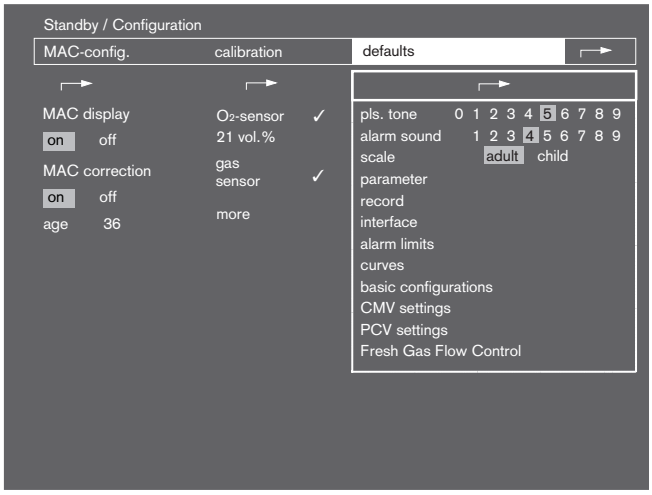
Display (example):

The menu requests the user to enter a 4-digit password in order to prevent unauthorized tampering with the basic settings. This password is given to authorized personnel during system training. This feature can be disabled or the password be changed by DrägerService on request.



- Turn dial knob to select digits consecutively from the line provided and press to confirm. The password is indicated underneath with asterisks (* * * *).
  The menu for selecting default settings appears when the password has been entered correctly.

  Display (example):



Setting Volume of the Pulse Tone (Optional)

0 = off
9 = maximum volume

- Select the line »**pulse tone**« by turning dial knob, press to confirm. The cursor automatically jumps to the last value selected (example: 5).
- Adjust value with dial knob, press to confirm.

Setting Audible Alarm Volume

1 = minimum volume
9 = maximum volume

- Select the line »**alarm sound**« by turning dial knob, press to confirm. The cursor automatically jumps to the last value selected (example: 4).
- Adjust value with the dial knob, press to confirm.

  O2 FAILURE and GAS FAILURE (O_2 and Air failure) will always be signaled with maxium volume, independent of the current alarm sound setting.

WARNING !

Always set audible alarm volume to a level that is sufficiently loud with respect to the general noise level of the surroundings.

NOTE: Local standards require a volume of at least 45 dB(A) for audible alarms. Therefore, settings 1 through 4 are configured to deliver this audio level.

Selecting the Scale

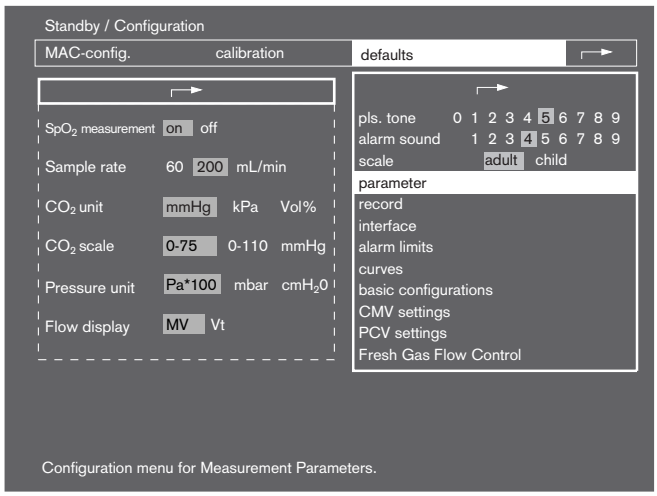
To adapt a default scale for the volumeter function and trend trace.

- Select the line »**scale**« with dial knob, press to confirm.
- Select »**adult**« or »**infant**« with dial knob, press to confirm.

Setting Measuring Parameters

- Select the line »**parameters**« with dial knob, press to confirm.
  The »**parameters**« menu appears in the left-hand field.

  Display (example):



Configuration menu for Measurement Parameters.

  Switch SpO_2 measurement (optional) on/off:

- Select the line »**SpO_2 measurement**« with dial knob, press to confirm.
- Select »**on**« or »**off**« with dial knob, press to confirm.

  Select sample rate for gas measurement:

- Select the line »**sample rate**« with dial knob, press to confirm.
- Select »**60**« or »**200 mL/min**« with dial knob, press to confirm.
  Recommendation: Select 200 mL/min.

  Set CO_2 units of measurement:

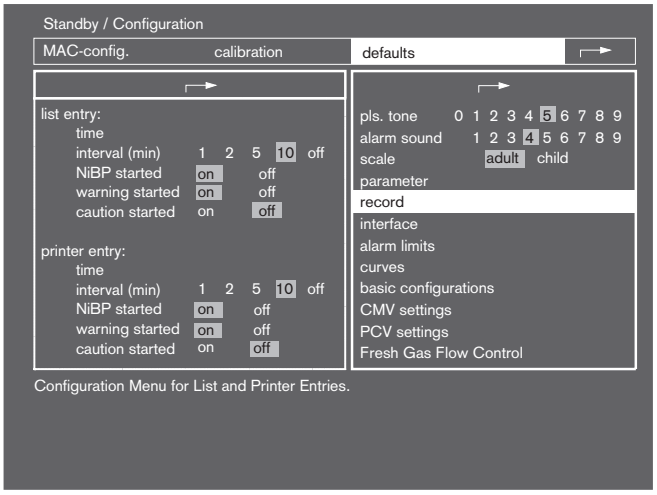
- Select the line »**CO_2 unit**« with dial knob, press to confirm. The last value selected is highlighted by a gray background.
- Select the desired units of measurement by turning dial knob, press to confirm.

Record

This function is used to determine the type of event that triggers an entry in the numerical trend or an online printout on the connected logging printer.

- Select the line »**record**« with dial knob, press to confirm.
  The »**record**« menu appears on the left-hand side.

  Display (example):



Configuration Menu for List and Printer Entries.

  Time interval-started **(min)**
  A list entry is activated after a fixed time interval in minutes.

  NiBP-started
  An entry is made after every NiBP measurement with new measured values. These values are read from an external monitor connected to Julian via MEDIBUS* interface.
  If no Dräger NiBP monitor is connected, no NiBP entries will be activated.

  warning-started
  An entry is made whenever a Warning message is triggered.

  caution-started
  An entry is made whenever a Caution message is triggered.

- Turn dial knob to select event triggering of entries, press to confirm.

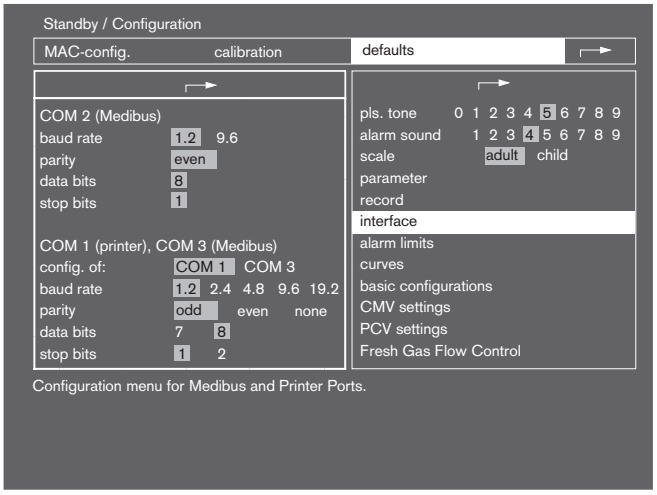
Configuring the Interfaces

Julian comes complete with three serial interfaces: COM1, COM2, COM3.
COM2 and COM3 are configured as MEDIBUS* interfaces and COM1 is configured as printer interface. Interfaces can be adapted to the equipment connected.

- Turn dial knob to select the line »**interfaces**«, press to confirm.
  The »**interfaces**« menu appears in the left-hand field.

  Display (example):

  COM2 is configured in the upper half of the menu and COM1 and COM3 in the bottom half.



Configuration menu for Medibus and Printer Ports.

* MEDIBUS: Dräger communications protocol for medical equipment.

Interface
Choice between configuration of COM2 or COM3.

Baud rate
Transmission rate (variable, see Instructions for Use of the equipment to be connected).

Parity
This display is fixed for MEDIBUS and is shown for information purposes only.

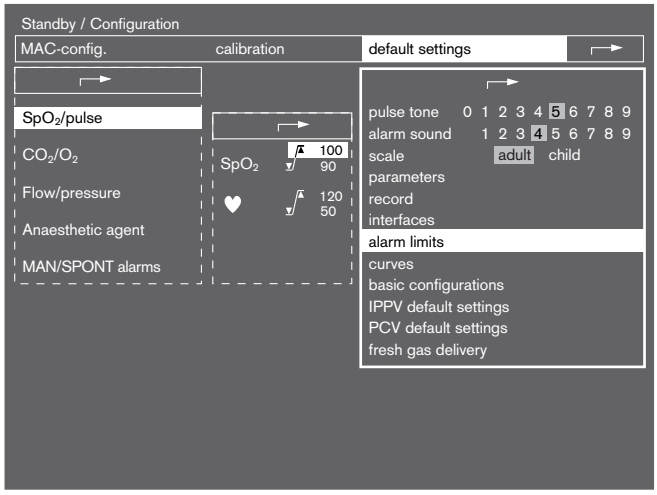
Data bits
This display is fixed for MEDIBUS and is shown for information purposes only.

Stop bits
This display is fixed for MEDIBUS and is shown for information purposes only.

Setting Default Alarm Limits

- Turn the rotary knob to select the line »**alarm limits**« and press to confirm.
  The »**alarm limits**« menu appears in the left-hand field.

Display (example):



- Select required parameter by turning the rotary knob and press to confirm.
  The "alarm limits" menu appears.
- In the menu, select the required alarm limit by turning the rotary knob and press to confirm. The default alarm limit is highlighted against a white background.
- Set and confirm the value with the rotary knob. The value is then displayed in normal mode.
  The cursor bar jumps to the next default alarm limit.
- Set the next default alarm limit as described above.

The following alarm limits can be configured:

SpO2/pulse	SpO2	Pulse rate			
CO2/O2	etCO2	FiCO2	FiO2		
Flow/pressure	MV	PAW			
Anesth. agent	Fi Iso.	Fi Hal.	Fi Sev.	Fi Enf.	Fi Des.
MAN/SPONT alarms	etCO2	FiCO2	FiO2	MV	

The etCO2 ↓/↑, FiCO2 /↑, FiO2 /↑ and MV ↓/↑ alarms can be configured »**ON**« or »**OFF**« in standby mode for the transition from MAN/SPONT. When the alarm limits are set to »**ON**«, the value is transferred from automatic ventilation mode.

Adjustment range for default alarm limits:

Alarm limits	Adjustment range	Factory default
SpO_2 [%]	51 to 100 50 to 99	– – 92
Pulse ♥ [1/min]	31 to 300 30 to 299	120 50
$EtCO_2$ [mmHg]	1 to 75 0 to 74	50 – –
$FiCO_2$ [mmHg]	0 to 10 – –	5 – –
MV [L/min]	0.1 to 39 0 to 38.9	12 3.0
FiO_2 [Vol.%]	19 to 100 18 to 99	– – 20
Fi Hal. [Vol.%]	0.1 to 7 0 to 6.9	1.5 – –
Fi Iso. [Vol.%]	0.1 to 7 0 to 6.9	2.3 – –
Fi Enf. [Vol.%]	0.1 to 7 0 to 6.9	3.4 – –
Fi Des. [Vol.%]	0.1 to 21.9 0 to 21.8	12.0 – –
Fi Sev. [Vol.%]	0.1 to 9.9 0 to 9.8	3.4 – –
PAW [cmH_2O]	5 to 98 0 to 35	40 8

Fixed alarm limits / times:

Apnea pressure	after 15 seconds
Apnea flow	after 15 seconds
Apnea CO_2	after 15 seconds (after 60 seconds in MAN/ SPONT)

– – : The alarm limit is deactivated as factory default.

NOTE: The newly set default alarm limits will be in effect whenever the system is switched on or started up from standby mode.

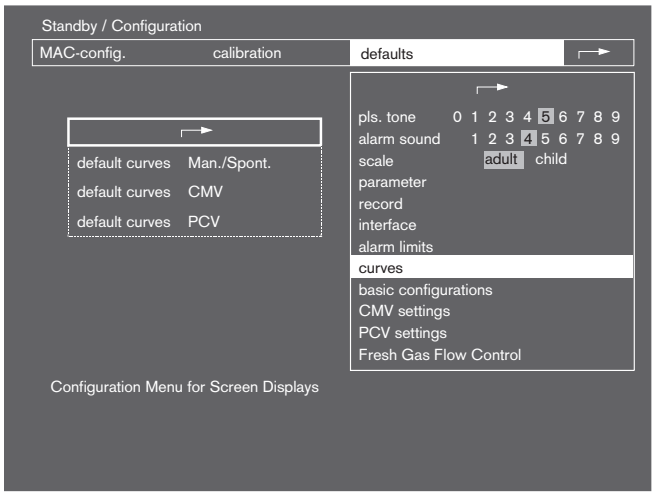
Certain alarm limits are switched off automatically in MAN/SPONT: see tables, alarm limits for MAN/SPONT, page 49.

Configuring Waveforms (Traces)

Three standard waveforms can be configured for each of the ventilation modes: MAN/SPONT, CMV and PCV.

- Turn dial knob to select the line »**curves**«, press to confirm.
  The selection menu appears in the left-hand field.

  Display (example):



Configuration Menu for Screen Displays

- Select desired ventilation mode with dial knob:

»**Default curves CMV**« has been selected in the example:

Currently selected parameters appear in the left-hand field, followed by the selection menu for selectable waveforms.

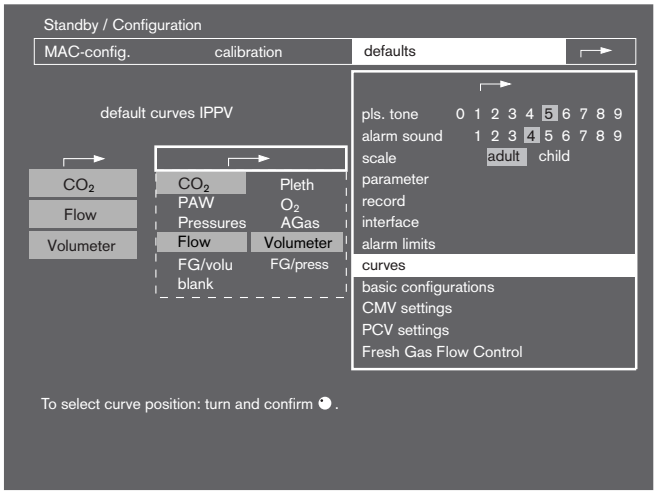
To replace a parameter:

- Select the respective parameter in the selection menu with dial knob, press to confirm. The parameter appears against a white background (inversed).

  The cursor jumps to the ⮡ symbol of the positioning menu.

- Select and confirm position of the new parameter with dial knob.

  NOTE: The corresponding position remains unused if »**blank**« is selected.



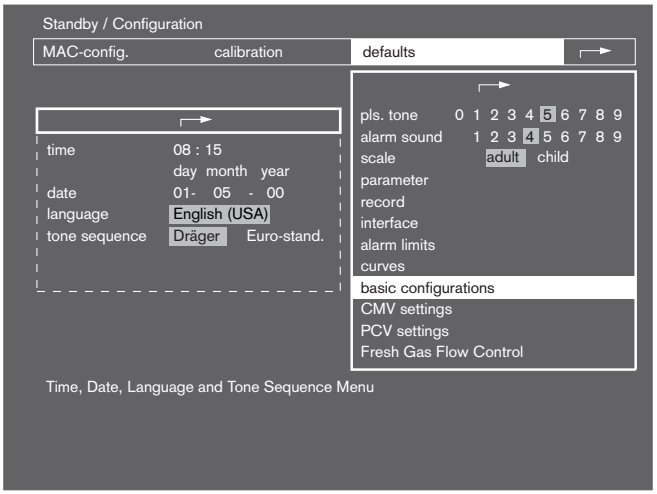
To select curve position: turn and confirm ◕.

Setting Basic Configurations

for time, date, language and alarm tone sequence.

- Turn dial knob to select the line »**basic configurations**«, press to confirm.
  The selection menu appears in the left-hand field.

  Display (example):



Time, Date, Language and Tone Sequence Menu

  Setting the date/time:

- Select and confirm the »**time**« line with dial knob.
  The cursor bar marks the hours.
- Press dial knob to confirm and the value will be highlighted against a white background (inversed). It can now be adjusted and confirmed with the dial knob.
  Minutes are adjusted and confirmed in the same way.
- Set and confirm date as described above.

  Setting the language of display texts:

  The selected language is displayed.

  The following alternatives can be selected:

English (**GB**)	French (**F**)	German (**D**)
Dutch (**NL**)	Italian (**I**)	Spanish (**E**)
US-English (**US**)	Danish (**DK**)	Norwegian (**N**)
Swedish (**S**)	Polish (**PL**)	Portugese (**P**)
Japanese (**JP**)	Greek (**GR**)	Hungarian (**HU**)
Catalan (**CA**)	Turkish (**T**)	

  To change the language setting:

- Turn dial knob to select the line »**language**«, press to confirm.
- Turn the dial knob until the desired language appears in the display window. Press dial knob to confirm selection. The texts in the menu now appear in the language selected.

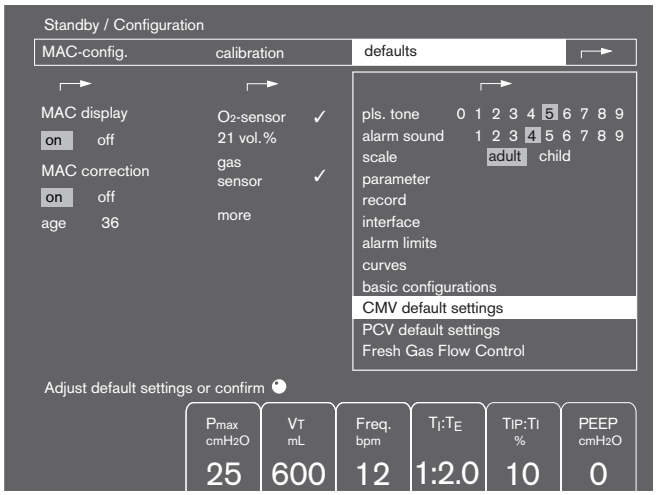
  Setting the alarm tone sequence:

- Turn the dial knob to select the line »**tone sequence**«, press to confirm.
- Select and confirm either the Dräger alarm tone sequence or the standard European alarm tone sequence.

CMV Default Ventilation Settings

- Select and confirm the line »**CMV default settings**« with dial knob.
  The menu keys for CMV are displayed:

  Display (example):



  To modify settings:

- Press the respective menu key.
- Set and confirm with dial knob.

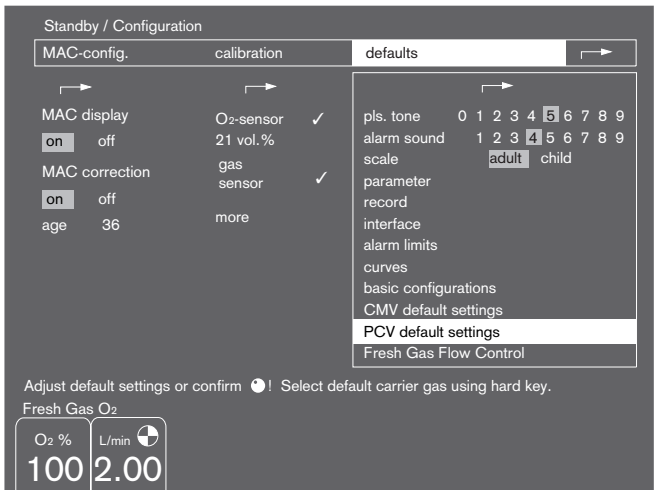
  To return to »**CMV default settings**«:

- Press dial knob.

PCV Default Ventilation Settings

- Select and confirm the line »**PCV default settings**« with dial knob.
  The menu keys for PCV are displayed:

  Display (example):



  To modify settings*:

- Press the respective menu key.
- Set and confirm with dial knob.

  To return to the »**PCV default settings**« menu:

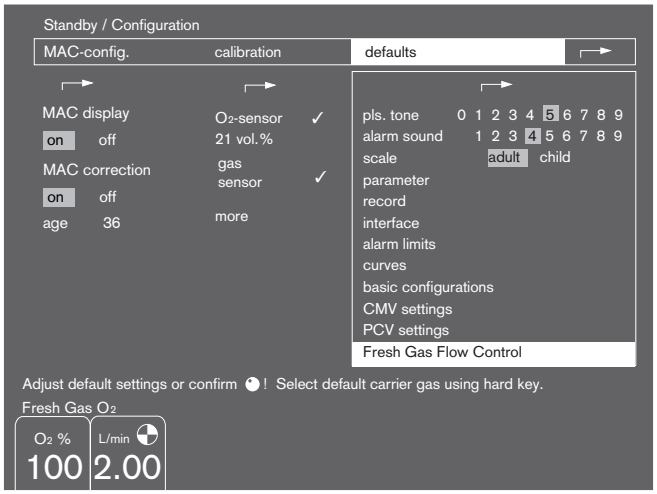
- Press dial knob.

* Maximum default setting for Pmax: 30 cmH2O.

Setting Fresh Gas Defaults

- Select and confirm the line »**Fresh Gas Flow Control**« with dial knob.
  The menu keys for fresh gas settings are displayed:

  Display (example):



  To modify settings:

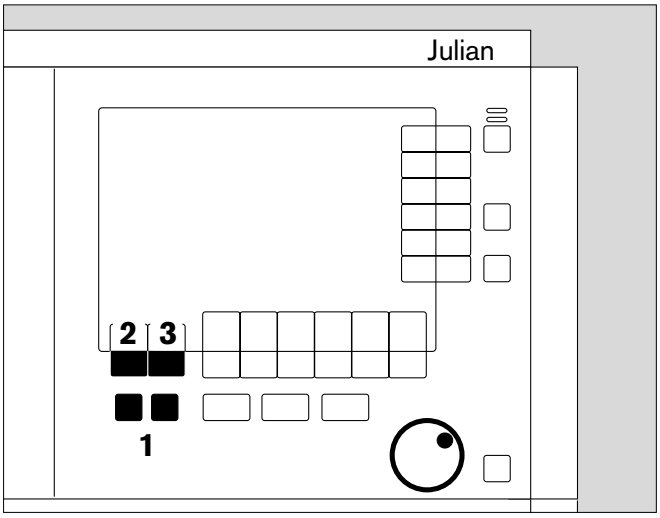
1 Press keys »**N2O**« or »**AIR**« to select default carrier gas, press dial knob to confirm.

2 Press »**O2 %**« menu key.

  Set default O2 concentration with dial knob, press to confirm.

3 Press »**L/min**« menu key.

  Set and confirm default fresh gas flow with dial knob.



  To return to the »**Fresh Gas Flow Control**« menu:

- Press dial knob.

Manual Calibration

Julian calibrates its sensors automatically during operation. The message **CAL** appears instead of the current measured value during the calibration process. Calibration of the O_2 sensor and zero calibration of the other gas sensors can be repeated manually, for instance if automatic calibration was unsuccessful.

In standby/configuration mode:

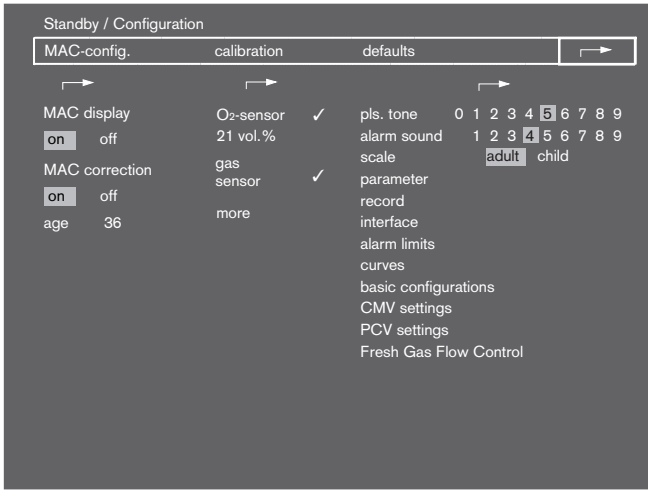
- Turn dial knob to select »**calibration**« column, press to confirm.
- Select and confirm appropriate line with dial knob, for example:
  »**O_2-sensor 21 vol.%**«

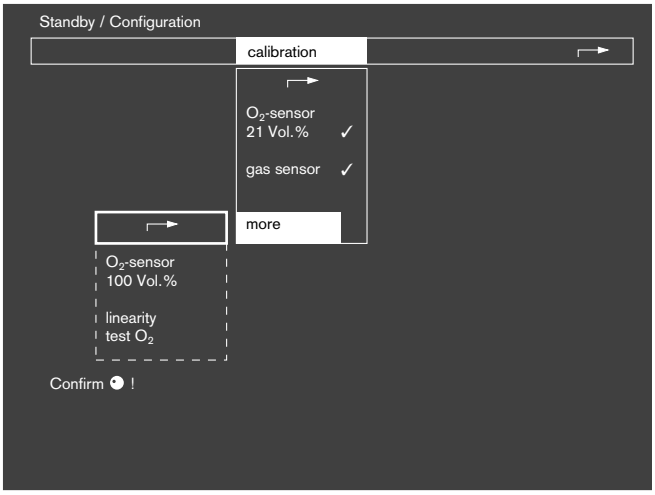
  The calibration process is started when the selection is confirmed. The clock symbol ◷ appears at the end of the respective line, indicating that calibration is in progress.

  When calibration is complete, a tick mark (✓) appears instead of the clock symbol. A question mark (**?**) indicates that calibration must be repeated because the previous calibration was not completed successfully.

  To further improve measuring accuracy of high O_2 concentrations, an additional 100 vol% O_2 calibration and a linearity test of the O_2 sensor can be performed under the »**more**« menu option.

  Other settings can already be made while calibration is in progress.





100 Vol.% O_2 Calibration

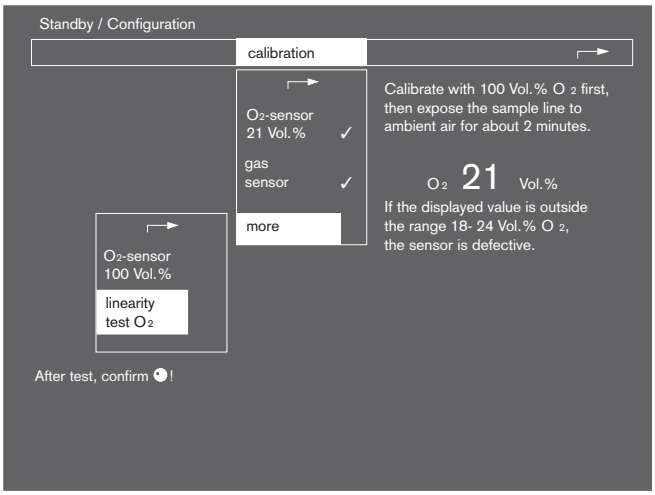
- Use a separate O_2 source, e.g. O_2 flowmeter. O_2 from the Julian breathing system is not suitable, as it will still contains traces of anesthetic gas.
- Unscrew sample line from the Y-piece and place it in the continuous flow of the O_2 source.
- Turn dial knob to select the choice
  »**O_2-sensor 100 vol.%**«
  and press to confirm.
- Allow continuous flow of O_2 into the sample line.

  A check mark (✓) appears after the field when calibration is complete.
- Screw the sample line back onto the Y-piece.

O_2 Linearity Test

- First perform "100 vol% O_2 calibration". Then:
- Turn dial knob to select the line **»linearity test O_2«** and press to confirm.

  After approx. 20 seconds:
- Display (example): **O_2 21 vol.%**
  A displayed value in the range between 18 and 24 vol% is acceptable.
  If value is outside this range, the O_2 sensor is defective or spent (replace O_2 sensor, see page 119).


Standby / Configuration
calibration
O2-sensor
21 Vol.%
gas
sensor
more
O2-sensor
100 Vol.%
linearity
test O2
Calibrate with 100 Vol.% O 2 first, then expose the sample line to ambient air for about 2 minutes.
O 2 21 Vol.%
If the displayed value is outside the range 18- 24 Vol.% O 2, the sensor is defective.
After test, confirm !

MAC configuration

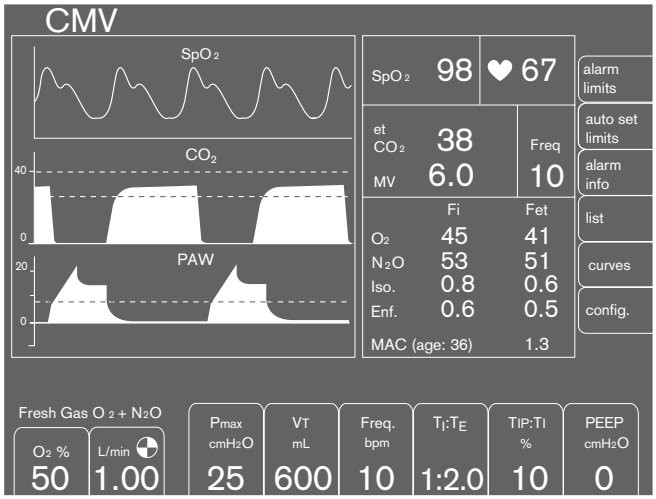
Anesthetic agent identification and display

Julian automatically identifies the anesthetic agent used and adjusts the measurement and monitoring of the anesthetic gas concentration to suit the gas identified.

If there is a mixture of two volatile anesthetic agents, the concentration of the secondary anesthetic agent is displayed from a MAC value of 0.1 MAC upwards. The gas with the higher expiratory MAC value is displayed above the secondary gas.

A secondary anesthetic agent becomes the main anesthetic agent if its MAC value exceeds the MAC value of the main anesthetic agent by 0.2 MAC.

A mixture of more than 2 volatile anaesthetic agents cannot be reliably detected.



Calculating the MAC values

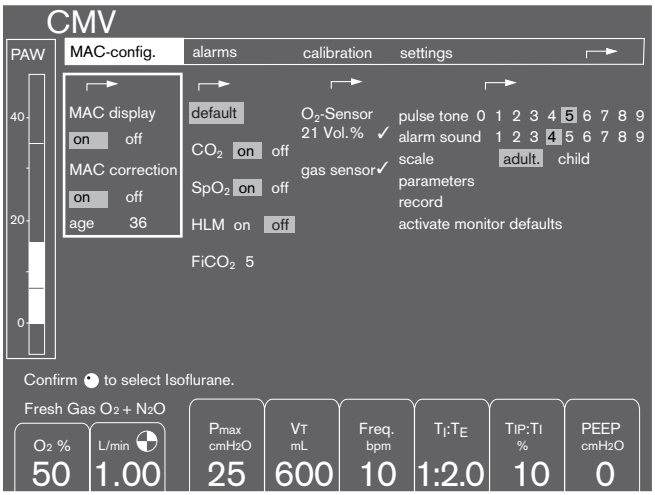
Julian calculates the MAC value (Minimum Alveolar Concentration) from the linear total of volatile anesthetic agents measured and N_2O. The measured values used are the end-expiratory concentrations. Partial pressures are taken into account.

Age-corrected MAC values are calculated according to W. W. Mapleson, British Journal of anesthesia 1996, pp. 179-185.

Displaying MAC

To activate the MAC display:

- Select column »**MAC-config.**« by turning the rotary knob and press to confirm.
- Select line »**MAC display**« by turning the rotary knob and press to confirm.
- Select line »**on**« by turning the rotary knob and press to confirm.



To select the age correction for the MAC display:

- Select line »**MAC correction**« by turning the rotary knob and press to confirm.
- Select line »**on**« by turning rotary knob and press to confirm.To select the patient's age:
- Select line »**age**« by turning the rotary knob and press to confirm.
- Set age by turning the rotary knob and press to confirm.

If the MAC display is configured to »**off**«, the »**MAC correction**« and »**age**« lines are automatically dimmed.

If MAC correction is configured to »**off**«, the »**age**« line is automatically dimmed.

MAC-Definition:

1 MAC is equal to the anesthetic gas concentration at which 50% of all patients no longer respond to a stimulation of the nerves.
The influence of other medication(opiates or intravenous hypnotics) is not taken into consideration when calculating MAC values.

Care

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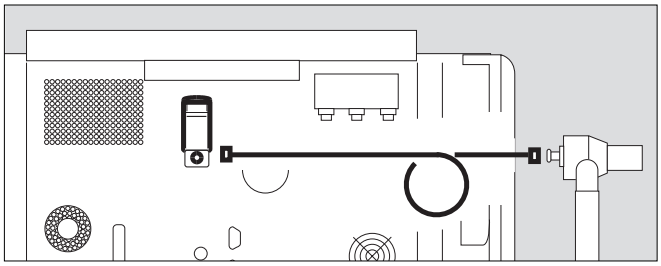
Disassembly

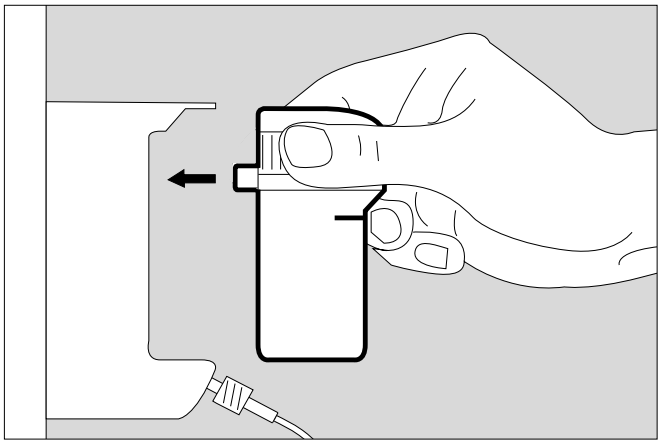
WARNING !

Always follow accepted hospital procedures for handling equipment contaminated with body fluids.

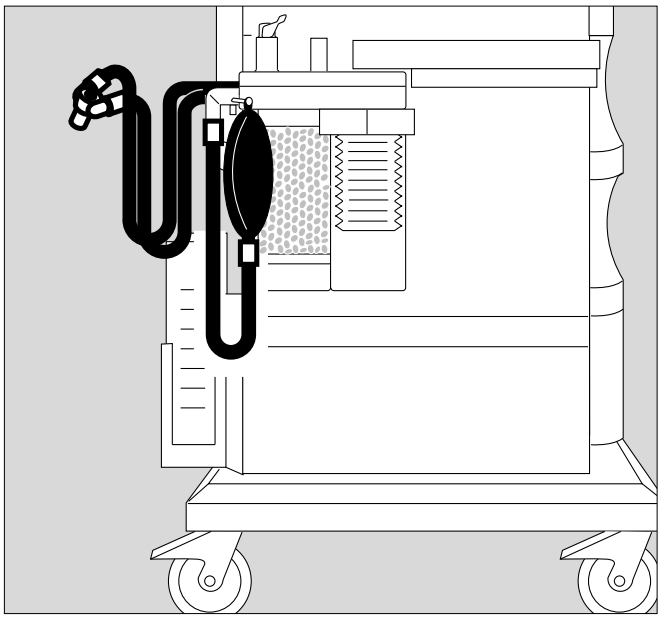
- Unscrew sample line from Y-piece and from water trap on the back of the unit.
  The sample line is not reusable and it can be disposed of together with ordinary domestic waste.



- Hold water trap by its ribbed surface and pull it out of its holder.
  It is not reusable and can be disposed of together with ordinary domestic waste.



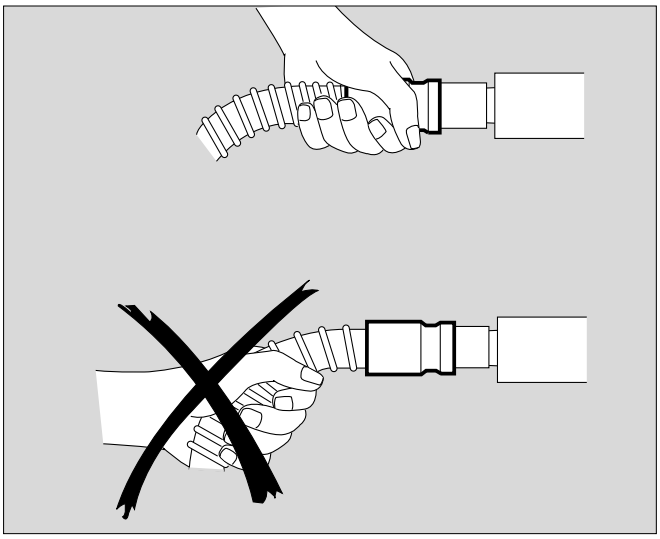
- Remove breathing hoses and breathing bag.
- Prepare breathing hoses, breathing bag and Y-piece for cleaning and disinfection in a parts washer/disinfection unit.



- Do not damage breathing hoses!

CAUTION !

When removing and connecting breathing hoses, always hold by the connector cuff and not by the spiral reinforcement, otherwise the reinforcing spiral may be torn off the cuff.
Breathing hoses with damaged spirals can easily be kinked and may interrupt ventilation!
Always check the breathing hoses for damage prior to use.
Damaged breathing hoses must not be used.



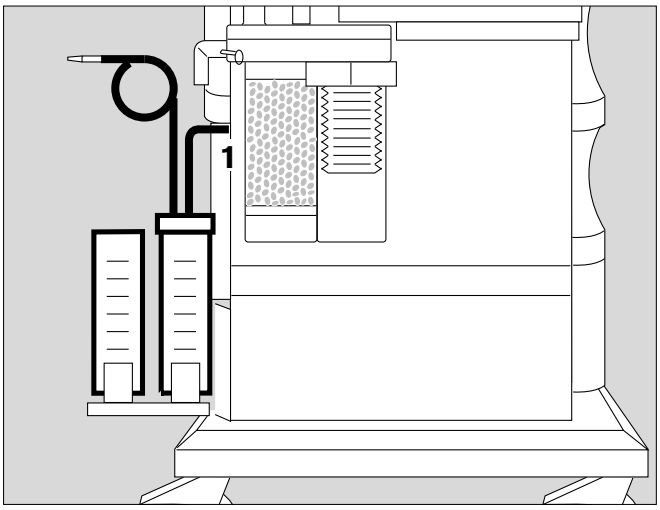
Dismantling the Suction System

1 Remove vacuum hose.

Refer to manufacturer's operating instruction for disassembly and care of the suction equipment.

WARNING !

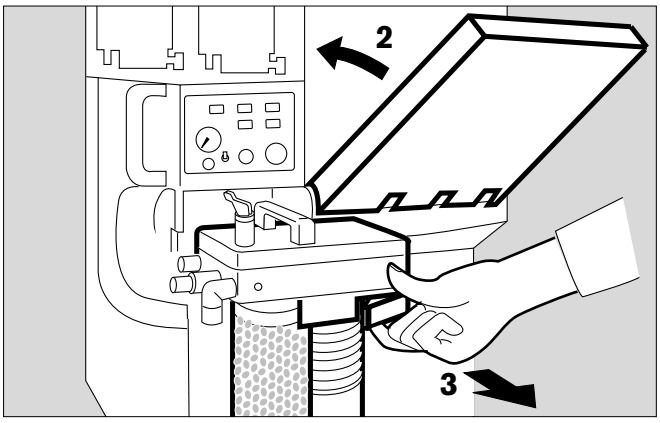
Always follow accepted hospital procedures for handling equipment contaminated with body fluids.



Dismantling the Breathing System

2 Fold up the writing top.

3 Pull catch and at the same time pull the slide-out breathing system module out



Removing the flow sensor

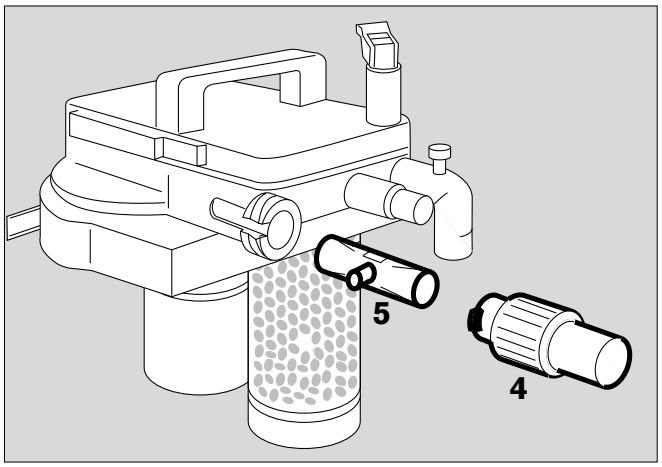
1 Unscrew expiratory port.

2 Remove flow sensor.

CAUTION !

Do not process flow sensor in cleaning and disinfection equipment or steam-autoclave flow sensor.

Do not use compressed air, a brush or similar tools to clean flow sensor as this could possibly damage the thin wires inside.



- The flow sensor must be disinfected in 70 % ethanol solution for approximately 1 hour.
  Leave sensor to dry in air for at least 30 minutes, otherwise the remaining alcohol can damage the sensor when calibrating.
- The flow sensor can be reused as long as it can be calibrated successfully.

Removing the absorber and bellows

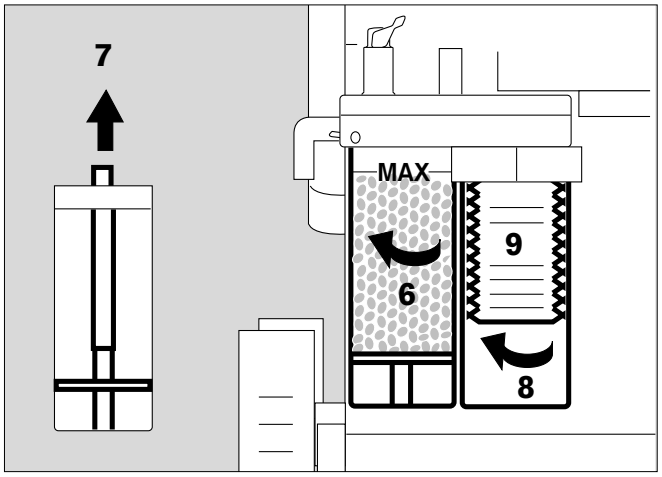
3 Turn absorber counterclockwise and pull downwards.

- Empty the soda lime.
  For disposal, refer to manufacturer's instructions.

4 Remove insert from the absorber.

WARNING !

Absorbent is caustic and is a strong irritant to the eyes, skin, and respiratory tract. When emptying absorber, take care not to spill its contents.



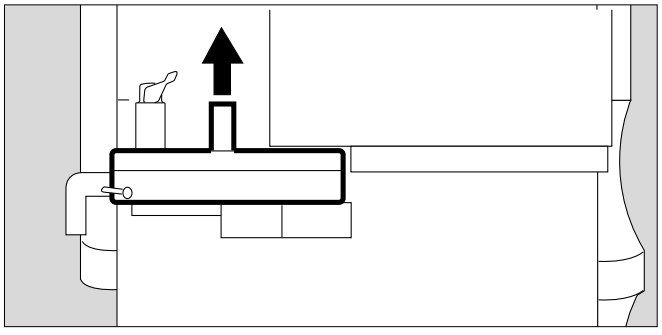
5 Turn container of the bellows counterclockwise and pull downwards.

6 Remove bellows.

- Prepare absorber, bellows container and the bellows for cleaning and disinfection in a parts washing/disinfection unit.

Removing the breathing system

- Hold breathing system by its handle and pull it out.

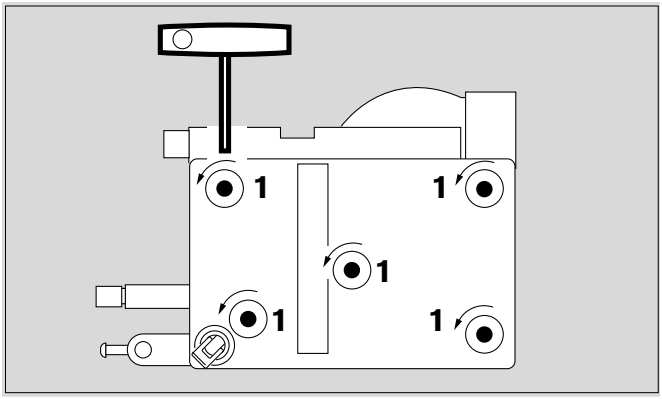


Opening the breathing system

– Weekly

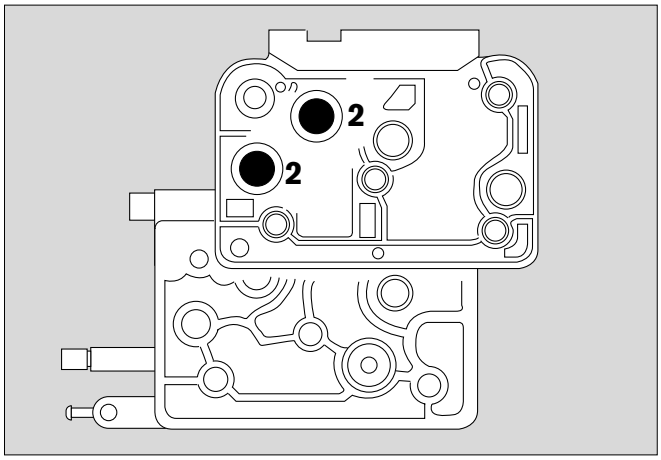
1 Loosen the five sealing screws a quarter-turn with the key supplied.

- Remove cover.



2 Remove the two valve discs.

- Lift off the metal valve plate.
- Keep valve discs in a cassette to protect them against damage and prepare them for cleaning and disinfection in a parts washing/disinfection unit.
- Prepare housing parts for disinfection and cleaning in a parts washing/disinfection unit.



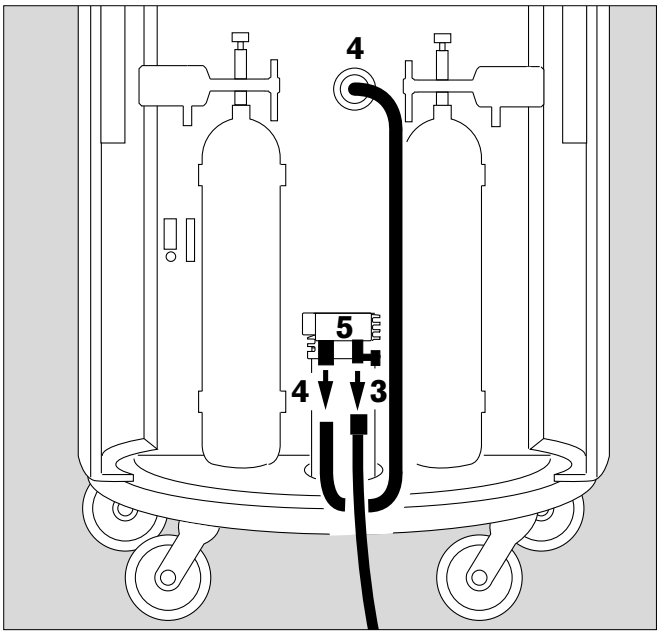
Anesthetic Gas Scavenging System (AGS)

3 Remove gas-disposal-assembly tubing.

4 Remove the transfer hose.

5 Remove the anesthetic gas scavenging system.

- Prepare the individual parts for cleaning and disinfection in a parts washing/disinfection unit.

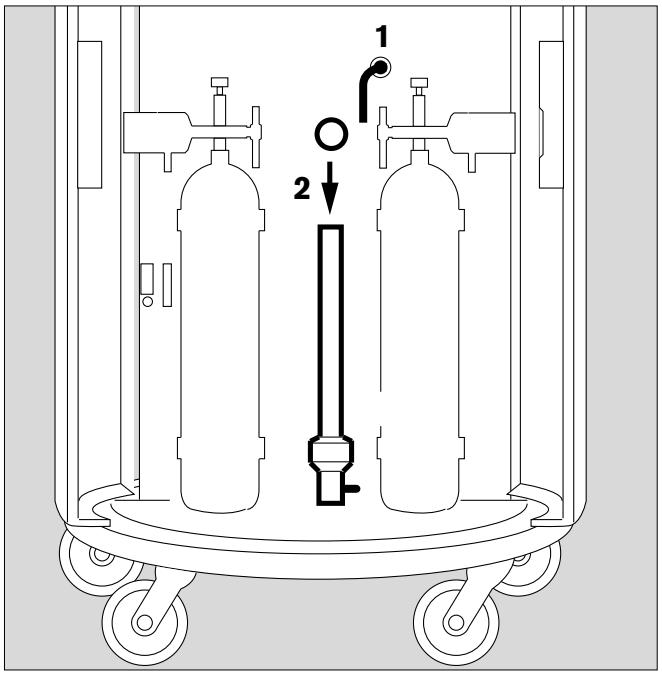


Waste gas connector

1 Disconnect the small silicon hose from the waste gas tube,

2 pull the waste gas tube out.

- Prepare the waste gas connector for cleaning and disinfection in a parts washing/disinfection unit.



Disinfecting/Cleaning/Sterilizing

Clean and sterilize the Julian Anesthesia Workstation and its parts according to the guidelines below. Follow your institution's policies regarding specific methods and agents for cleaning and sterilization. Determination of the need and frequency of sterilization of any particular component is the responsibility of the user institution. Sterilization procedures should be performed according to procedures established by the user institution following the specific instructions provided by the manufacturer of the sterilizing equipment or agent to be used. Such policies, procedures, and instructions should ultimately be consistent with established principles of clinical microbiology and infection control.

CAUTION !

The exterior and certain other components of the anesthesia workstation consist of materials that are sensitive to certain organic solvents sometimes used for cleaning and disinfecting (e.g., phenols, halogen releasing compounds, oxygen releasing compounds, strong organic acids, etc.). Exposure to such substances may cause damage that is not always immediately apparent. Sterilization with ethylene oxide (EtO) or formaldehyde is also not permitted.

To prevent any damage, we recommend that only detergents and disinfectants are used that are compatible with the device, e.g. surface disinfectants on the basis of aldehydes, alcohols, or quarternary ammonium compounds for disinfection.

Ensure that all disinfectants are registered with the U.S. Environmental Protection Agency for use as intended. Always follow the instruction labels specifically with respect to prescribed concentrations and the necessary exposure times.

Disinfectants often contain – besides their main active agents – additives that can also damage materials. When in doubt, ask the supplier/manufacturer of the disinfectant/ cleaning agent.

For a list of materials used in the anesthesia machine, please refer to page 145.

WARNING !

Follow all accepted hospital procedures for disinfecting parts contaminated with body fluids (protective clothing, eyewear, etc.).

All parts of the breathing system, valve discs, bellows, bellows container, Y-piece, breathing circuit, breathing bag, parts of the absorber and Resutator 2000, and parts of the anesthetic gas scavenging system

- Disinfect in hot liquid disinfectant – in a disinfecting machine at 93 °C (200 °F) for 10 minutes.
  Only use cleaning agent, no alkaline or chlorine-releasing substances – risk of corrosion!
- can be sterilized in a steam-autoclave at 134 °C (273 °F).

Surfaces of Julian, gas supply hoses, cables and Vapor 19.3 / Vapor 2000 .

CAUTION !

Do not treat exterior surfaces of the workstation with disinfecting agents containing alcohol.

CAUTION !

Do not allow liquid to enter the interior of the Julian Workstation.

- Wipe off visible soiling with a damp disposable cloth.
- Disinfect with a wipe disinfectant based on the active ingredients outlined.
  Always follow manufacturer's Instructions for Use.

Flow sensor

- Disinfect for approximately 1 hour in 70 % ethanol solution.
  Leave sensor to dry in air for at least 30 minutes, otherwise the remaining alcohol can damage the sensor when calibrating.

CAUTION !

Do not process flow sensor in cleaning and disinfection equipment or steam-autoclave flow sensor.

Do not use compressed air, a brush or similar tools to clean flow sensor as this could possibly damage the thin wires inside.

- The flow sensor can be reused as long as it can be calibrated successfully.
- Dispose of flow sensor as infectious special waste. It may be incinerated at temperatures of more than 800 °C (1472 °F)

NOTE: All components to be processed are listed in the care list for Julian on pages 114 and 115, together with their appropriate disinfection methods and intervals.

Care List for Julian Anesthesia Workstation

Only applies for non-infectious patients.

When used with infectious patients, all parts in contact with breathing gas must additionally be sterilized after cleaning and disinfection.

What **Components which can be processed**	How often **Processing intervals**[1)]			
	with filter on Y-piece	with filter on inspiratory and expiratory port	without filter	
Julian workstation	Front daily, other surfaces weekly			
Vapor 19.n / Vapor 2000	Daily			
Power cable, gas supply hoses, equipotential bonding lead	Monthly			
Breathing bag and hose	Daily	Daily	Per patient	
Bellows	Weekly	Weekly	Daily	
Cover of breathing system with APL valve	Weekly	Weekly	Daily	
Valve discs	Weekly	Weekly	Daily	
Bottom part of breathing system	Weekly	Weekly	Daily	
Container of bellows	Weekly	Weekly	Weekly	
Valve discs (use a cassette)	Weekly	Weekly	Daily	
Expiratory port	Weekly	Weekly	Daily	
Absorber and insert	Weekly	Weekly	Daily	
Filter of the sample gas recirculation system	Weekly	Weekly	Weekly	
Flow sensor	Weekly	Weekly	Daily	
AGS housing	Weekly			
AGS flow tube (without filter)	Weekly			
Container for AGS buffer volume	Weekly			
AGS transfer hose	Weekly			
Gas disposal assembly tubing with connector	Monthly			
Waste gas connector with tube	Weekly			
Hose of sample gas scavenging	Weekly			
	1) The processing intervals depend on the use and position of the filters. The table is merely intended as a guideline in the absence of established hospital protocols for cleaning and disinfection intervals			

The parts should preferably be cleaned and disinfected in a parts washing/disinfection unit, or by immersion.
Julian and its components must not be treated with formaldehyde vapors or ethylene oxide!

	Washing machine[2] 93 °C 10 minutes	Wiping[3]	Immersion[3]	**Sterilization** Steam, 134 °C (273 °F), 10 min.
	no	outside	no	no
	no	outside	no	no
	no	yes	no	no
	yes	yes	no	yes
	yes	no	possible	yes, max. 25 times
	yes	no	possible	yes
	yes	no	possible	yes
	yes	no	possible	yes
	yes	no	possible	yes
	yes	no	possible	yes
	yes	no	possible	yes
	no	outside [4]	no	yes, max. 10 times
	no	outside	possible [5]	no
	yes	no	possible	no
	no	yes	no	no
	yes	no	possible	yes
	yes	no	possible	no
	yes	no	possible	no
	yes	no	possible	no
	yes	no	possible	yes

2) Only use cleaning agents, no alkaline or chlorine-releasing substances. Risk of corrosion!
3) Surface disinfectants based on aldehydes, alcohols and quaternary ammonium compounds, such as PaMo dur rapid or PaMo sept (Dräger Parts&More GmbH) can be used to ensure compatibility.
4) Do not use any agents containing alcohol.
5) Disinfect the flow sensor in 70% ethanol solution for approximately1 hour and leave to dry in air for at least 30 minutes.

Assembly

Assembling the Breathing System

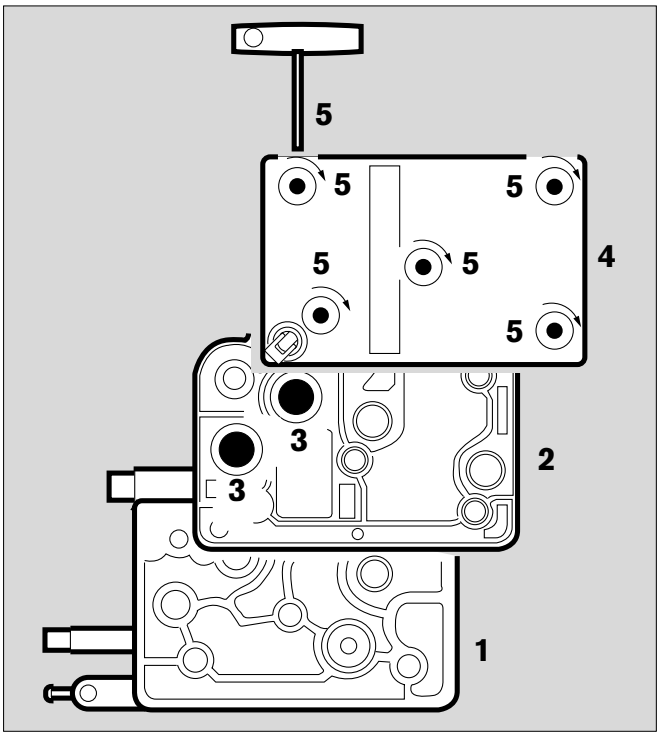
1 Place the bottom section on a flat surface.

2 Fit valve plate on top of the bottom section.

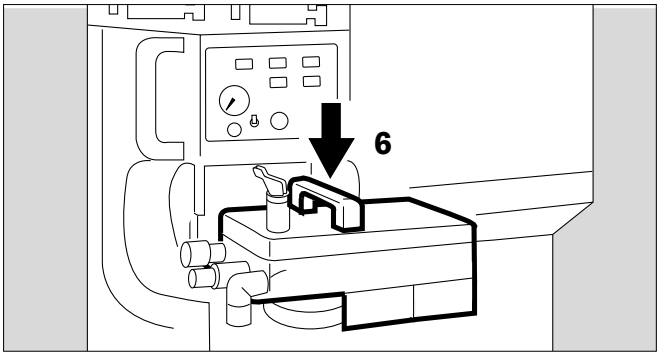
3 Insert both valve discs.

4 Tightly fit cover.

5 Tighten all five sealing screws a quarter-turn.



6 Hang breathing system into the slide-out module.

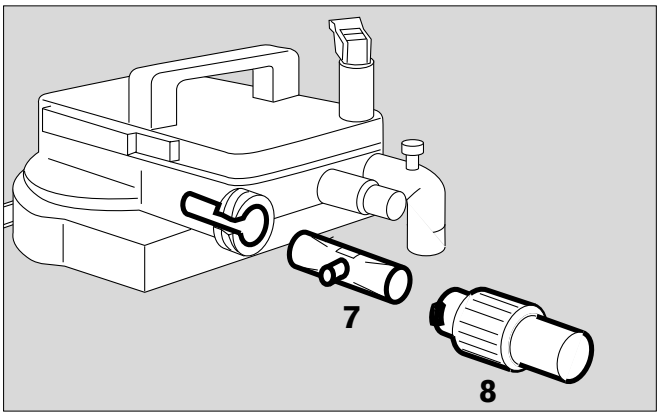


Installing the flow sensor

7 Insert flow sensor into receptacle orienting the electric connector socket to fit into the slot.

8 Push expiratory port onto sensor with the nose of the port in the receptacle slot.

- Tighten knurled nut by hand.

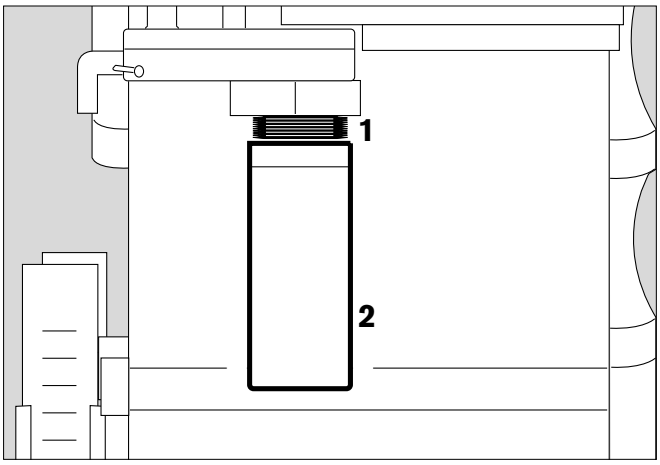


Installing the bellows

- Hold breathing system from above to prevent it from dropping out and

1 uniformly slide the tightly compressed bellows onto the connector.

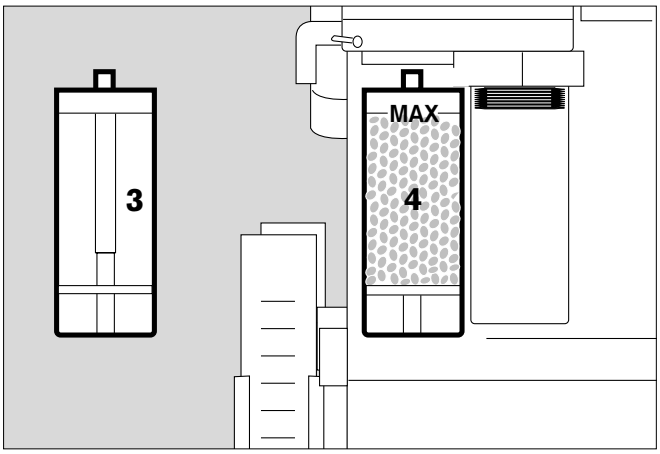
2 Insert bellows container into the breathing system from below and turn it clockwise as far as possible.



Filling and installing the absorber unit

3 Push insert fully into the absorber.

- Fill the absorber with fresh soda lime – up to the MAX mark.
  We recommend using Drägersorb.



WARNING !

Absorbent is caustic and is a strong irritant to the eyes, skin, and respiratory tract. When filling absorber, take care not to spill its contents.

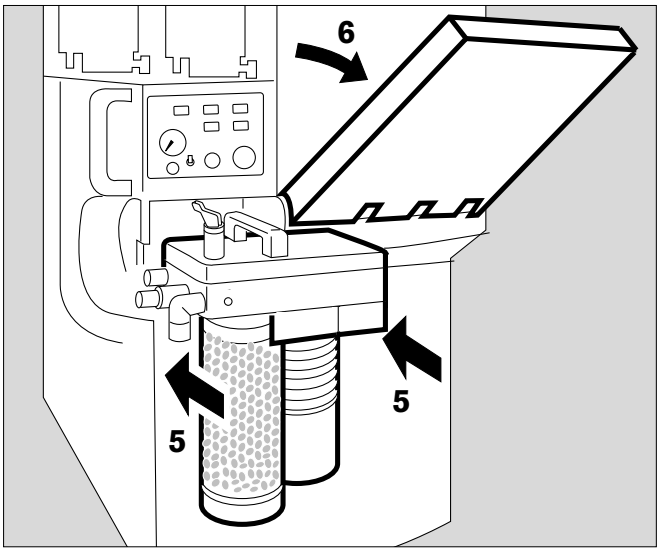
If the breathing system is to remain unused during the next 24 hours:

- Only fill with soda lime immediately before use! Soda lime dries out when exposed to ambient air and sun for a longer period of time. This reduces the CO_2 absorption capacity and the effectiveness of the indicator.

4 Insert absorber into the breathing system from below and turn clockwise as far as possible.

5 Slide in breathing system – as far as possible.

6 Fold down the writing top.



For installation of breathing circuits, suction system, etc., see page 27, "Preparation".

Maintenance

CAUTION !

In case of malfunction of this device, contact your qualified local Dräger Service representative.

The device must be inspected and serviced (preventive maintenance) by competent and factory authorized technical service representatives at regular 6 month intervals. A record must be kept on this preventive maintenance. We recommend obtaining a service contract through your vendor.

Maintenance or repair of the Julian Anesthesia Workstation shall be performed only by Dräger qualified technical service representatives.

WARNING !

To avoid any risk of infection, clean and disinfect ventilator and accessories before any maintenance according to established hospital procedures - this applies also when returning ventilators or parts for repair.

WARNING !

Preventive Maintenance work on the Julian Anesthesia Workstation shall be performed by trained and factory authorized staff only.

WARNING !

Disconnect power!

Before opening the unit, always disconnect plug at the wall outlet first.

Maintenance Intervals

Preventive maintenance and service	By factory trained and authorized technical representatives every six months
O_2 sensor	Replace when calibration is no longer possible or when the message **FIO2 INOP !** is displayed. Disposal, see page 120.
Flow sensor	Replace when calibration is no longer possible or when the message **FLOW INOP !** is displayed. May be incinerated at temperatures of more than 800 °C (1472 °F).
Sample gas water trap	Replace when fill level reaches the mark or when the message **CO2 LINE BLK !** is displayed (assuming the sample line was not otherwise blocked).
Cooling air filter, set of 3	Should be cleaned and thoroughly dried or replaced every month. Must be replaced after one year at the latest. Dispose of as domestic waste.
Lithium battery for data backup (2x)	Must be replaced by factory trained and authorized technical representatives after two years. Dispose of in accordance with all applicable waste disposal regulations.
Lead gel battery pack (2x)	Must be replaced by factory trained and authorized technical representatives after two years. Dispose of in accordance with all applicable waste disposal regulations.
Optical measuring system for determining the anesthetic gas concentration	Must be checked by factory trained and authorized technical representatives every six months.
Time-keeper RAM	Must be replaced by professionals after four years. Must be disposed of in accordance with the local waste disposal regulations.

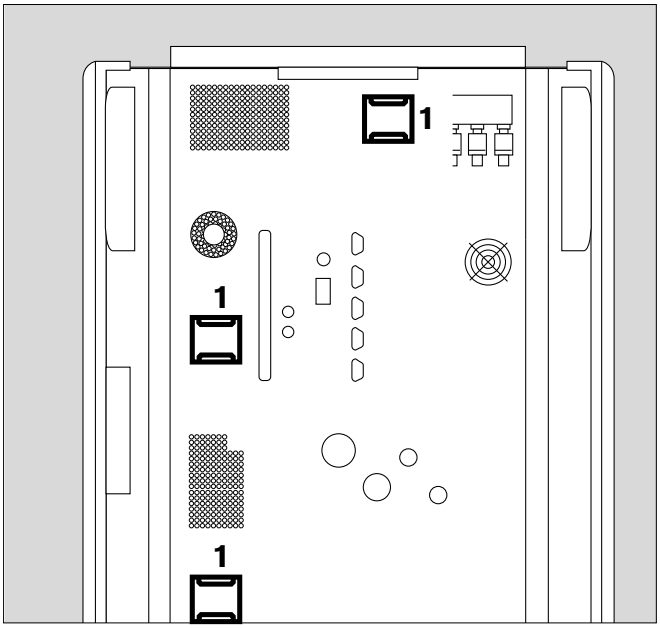
The supplier will make circuit diagrams, component part lists, descriptions and calibration instructions available on request if needed for the maintenance of Julian.

Cleaning /Replacing Cooling Air Filters

– Clean filters monthly

1 Remove all three cooling air filters from their holders.

- Clean in warm water to which a detergent has been added; dry thoroughly.
- Insert cooling air filters into their holders without creasing.
- Replace cooling air filters after not more than one year. Dispose of filters as domestic waste.

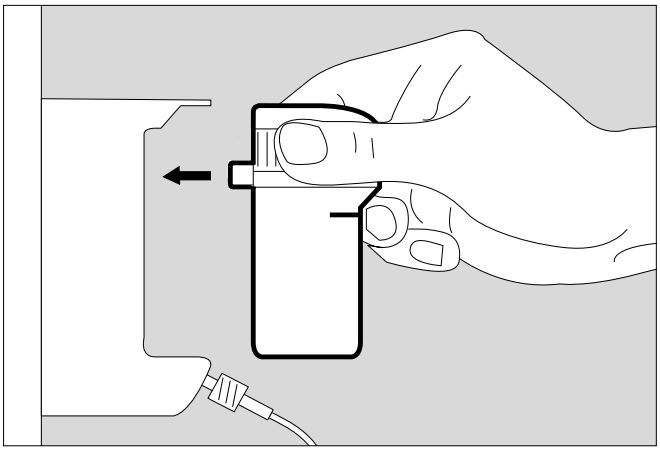


Replacing Water Trap

– When fill level reaches the mark

or

– when the message
CO_2 LINE BLK ! is displayed
(if the sample line is correctly installed and free of any blockage).



- Hold water trap by its ribbed surface and pull it out of its holder.
- Push a new water trap into the holder until it clicks into place
- Dispose of old water trap as domestic waste.

Replacing O_2 Sensor

– When the message

FIO_2 INOP! is displayed
or

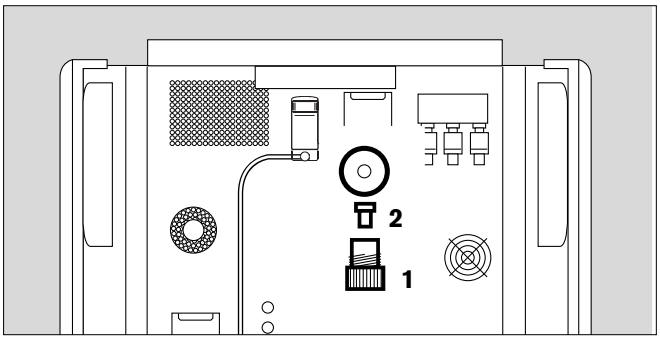
– when the sensor can no longer be calibrated.

1 Unscrew sensor holder containing O_2 sensor.

2 Remove the spent O_2 sensor from the holder and insert a new O_2 sensor.

1 Screw holder back in its place.

- For disposal of spent O_2 sensors, see page 120.



Disposing of Batteries and O_2 Sensors

WARNING !

Treatment of batteries and O_2-sensor capsules:

Do not throw into fire! Risk of explosion.

Do not force open! Danger of bodily injury.

Follow all local, state, and federal regulations with respect to environmental protection when disposing of batteries and O_2-sensor capsules.

Troubleshooting

Contents

Troubleshooting..... 122

Troubleshooting

Julian displays alarm messages at 3 levels of priority:
(For definitions of alarm priority levels, see page 69)

!!! Warning = Message with top priority
!! Caution = Message with medium priority
! Advisory = Message with low priority

In the table below, messages are listed in alphabetical order.
The table should help you to identify the cause of an alarm and to ensure rapid remedy of the problem.

Message		Cause	Remedy
AGT ERR	! *	Anesthetic gas measurement faulty.	Call DrägerService.
2nd AGENT	!	2nd Anesthetic agent recognized	Flush system if necessary. Check fresh gas setting. Wait for transitional phase.
AIR SUPPLY	!!!	Compressed air supply has failed. Central supply connector not plugged in.	Check connection to central supply.
		Compressed air hose kinked.	
		Air compressor failure.	Check compressor.
APNEA CO_2	!!!	Breathing/ventilation has stopped. No breath detected for 15 seconds.	**WARNING Patient must immediately be ventilated by hand!**
			Check ventilator setting. Ensure it is not disconnected.
		No breath detected for 60 seconds in "MAN/SPONT alarm limits" alarm mode.	**WARNING Patient must immediately be ventilated by hand!**
			Check patient's spontaneous breathing ability.
APNEA PRESSURE	!!!	Ventilation has stopped. No change of pressure detected for 15 seconds.	**WARNING Patient must immediately be ventilated by hand!**
		Inadequate supply of fresh gas.	Check fresh gas setting.
		Leak in patient circuit.	Check that hose system is not disconnected.
		Patient connection open.**	Connect patient up correctly.
APNEA VOL	!!!	Ventilation has stopped. No expiratory tidal volume for 15 seconds.	**WARNING Patient must immediately be ventilated by hand!**
			Check ventilator setting.
		Inadequate supply of fresh gas.	Check fresh gas setting.
		Circuit kinked.	Check hose system.

* Advisories related to hardware errors (e.g. sensor failures) are announced without audible signal.

** In automatic ventilation mode and with PEEP = 0, due to its very low internal breathing resistances, the workstation can display a measured value for the minute volume. This display is irrelevant in conjunction with the message "APNEA PRESSURE!!!".

Message			Cause	Remedy
AW TEMP HIGH	!!!		Breathing gas temperature above 40 °C.	If using a breathing gas humidifier: disconnect humidifier. If using heated patient circuit: remove plug of circuit heater.
BATTERY LOW	!!!		Battery capacity of the uninterruptible power supply is almost exhausted.	Prepare manual ventilation with 100 % O_2.
CO_2/AGT ERR	!	*	CO_2 / anesthetic gas measurement faulty, and consequently: aspiratory O_2 measurement faulty.	Call DrägerService.
CO_2 ALRM OFF	!	*	APNEA CO2, INSP CO2 HI or ET CO2 HIGH alarm disabled.	
CO_2 ERR	!	*	CO_2 gas measurement faulty.	Call DrägerService.
CO_2 LINE BLK	!		Sample line blocked.	Check sample line and water trap: replace if necessary. Check that hose to anesthetic gas scavenging system is not kinked.
COOLING ?	!	*	Internal system temperature is too high or fan for mixer electronics is defective.	Clean filter on the back panel. Call DrägerService.
ET CO_2 HIGH	!!		Upper alarm limit for end-expiratory CO_2 concentration has been exceeded for at least two breaths.	Check ventilation.
ET CO_2 LOW	!!		End-expiratory CO_2 concentration has fallen below lower alarm limit for at least two breaths.	Check ventilation.
EXP MAC ⎍	!!		Upper alarm limit for expiratory MAC value has been exceeded.	Check Vapor setting. Check fresh gas setting.
% HAL HIGH % ISO HIGH % ENF HIGH % DES HIGH % SEV HIGH	!!! !!! !!! !!! !!!		Inspiratory gas concentration of the respective anesthetic agent exceeds upper alarm limit. Upper alarm limit has been exceeded for at least two breaths.	Check setting of anesthetic vaporizer.
% HAL LOW % ISO LOW % ENF LOW % DES LOW % SEV LOW	!! !! !! !! !!		Inspiratory gas concentration of the respective anesthetic agent is below lower alarm limit. Value has remained below the lower alarm limit for at least two breaths.	Check setting of anesthetic vaporizer.
% O_2 LOW	!!!		Inspiratory O_2 concentration is below lower alarm limit.	Check O_2 supply. Check O_2 concentration in fresh gas flow.

* Advisories related to hardware errors (e.g. sensor failures) are announced without audible signal.

Message			Cause	Remedy
% O_2 HIGH	!!		Inspiratory O_2 concentration exceeds upper alarm limit. O_2 flush used.	Check O_2 concentration in fresh gas flow.
% O_2 ERR	!	*	O_2 measurement defective.	Call DrägerService.
			O_2 sensor exhausted or defective.	Replace O_2 sensor, see page 121.
			O_2 sensor not used.	Use O_2 sensor.
FRESH GAS ?	!		Fresh gas flow too low.	Increase fresh gas flow.
			Leakage in the breathing system or in the patient hose.	Check breathing system for leakages.
GAS FAILURE	!!!		Failure of O_2 and AIR supply.	Open backup O_2 cylinder. Check connection to supply pipeline.
INSP CO_2 HI	!!		Inspiratory CO_2 concentration exceeds the upper alarm limits set.	Replace soda lime in absorber system.
				Valve discs in breathing system defective.
				Set sample rate to 200 mL/min due to high frequency and time constant of CO_2 sensor.
INSP MAC ⁄	!!		Upper alarm limit for inspiratory MAC value has been exceeded.	Check Vapor setting. Check fresh gas setting.
JULIAN COM 2 ? JULIAN COM 3 ?	! !	*	Communication via RS 232 interface COM 2/COM 3 has been interrupted.	Check connector plugs on Julian and the connected device.
MIN VOL HIGH	!!		Minute volume exceeds upper alarm limit.	Correct tidal volume or respiration rate.
MIN VOL LOW	!!		Minute volume below lower alarm limit.	Check breathing system. Check setting of ventilator.
			Tube blocked/kinked.	Check tube.
			Leak in breathing system.	Seal breathing system.
			Ventilation volume reduced by pressure limitation.	Correct ventilation pattern.
			Inadequate fresh gas flow.	Increase fresh gas flow.
MIXED AGENT	!		The gas measuring system has detected a mixture of more than two anesthetic agents.	Flush system if necessary. Check fresh gas setting.
NO SPO_2 PULS	!!!		No pulse signal detected by SpO_2 measurement for approx. 10 seconds.	**Check patient's condition!**

* Advisories related to hardware errors (e.g. sensor failures) are announced without audible signal.

Message			Cause	Remedy
N_2O SUPPLY ?	!!!		N_2O supply has failed.	Open the N_2O backup cylinder.
			Supply pipeline connector is not plugged in or N_2O hose is kinked.	Check connection to supply pipeline. Restore N_2O supply.
			N_2O cylinder empty.	Connect a full N_2O cylinder.
O_2 SUPPLY ?	!!!		Oxygen supply has failed.	Open the O_2 backup cylinder.
			The supply pipeline connector is not plugged in or O_2 hose is kinked. O_2 cylinder empty.	Check connection to supply pipeline. Restore O_2 supply.
			O_2 cylinder empty.	Connect a full O_2 cylinder.
PAW HIGH	!!!		Airway pressure exceeds upper alarm limit.	
			Ventilation hose kinked.	Check hose system.
			Stenosis.	
			Pressure limit set too high.	Correct pressure limit.
PAW NEGATIVE	!!!		Inadequate supply of fresh gas.	Set adequate fresh gas flow on the anesthesia workstation
			Mean pressure p_{mean} less than –2 cmH_2O.	
			Airway pressure PAW less than –7 cmH_2O least 3 seconds.	
P MAX?	!		PCV pressure limit not reached.	Seal the leak. Correct pressure limit, inspiratory flow or inspiration time if necessary.
POWER FAIL	!		Electrical supply failure.	Check battery capacity. Prepare manual ventilation.
PRESS ERR	!	*	Pressure sensor failed.	Call DrägerService.
PRESSURE LIM	!!		The ventilator is operating in pressure-limited mode. Lung compliance has changed.	
			Tube kinked. Bacteria filter on inspiratory or expiratory side is clogged .	Check tube/bacteria filter. If necessay, increase P_{max} or reduce V_T.
SAFETY O_2 ON	!!		Safety O_2 control valve is open during normal operation.	Close Safety O_2 immediately.
SPO_2 ERR	!	*	SpO_2 measurement defective.	Call DrägerService.
SPO_2 PULS LO	!!!		Pulse rate has dropped below set alarm limit.	**Check patient's condition!**
SPO_2 PULS HI	!!		Pulse rate exceeds upper alarm limit.	**Check patient's condition!** Correct alarm limit if necessary.

* Advisories related to hardware errors (e.g. sensor failures) are announced without audible signal.

Message			Cause	Remedy
SPO_2 LOW	!!!		Oxygen saturation is below set lower alarm limit.	Check ventilation.
				Check O_2 concentration of fresh gas.
				Check SpO_2 sensor!
SPO_2 SEN DISC	!		SpO_2 sensor not plugged in.	Check sensor connection.
SPEAKER FAIL	!	*	No alarm tone, loudspeaker faulty.	Call DrägerService.
SYSTEM FAULT	!!!		Internal device error.	**WARNING Ventilate patient manually. Do not operate the system.**
				Call DrägerService.
WATER TRAP	!		The collecting jar of the water trap at the back of the unit is full.	Exchange the watertrap, WaterLock.
VENT ERR	!!!		The ventilator control unit is performing an internal restart which takes about 30 seconds. Julian is then restored to its previous operating mode.	**WARNING Ventilate patient manually. Do not operate the system.**
VOL ALRM OFF	!	*	APNEA VOL or MIN VOL LOW alarm disabled.	
VOL ERR	!	*	Flow sensor defective.	Replace flow sensor.

* Advisories related to hardware errors (e.g. sensor failures) are announced without audible signal.

What's What

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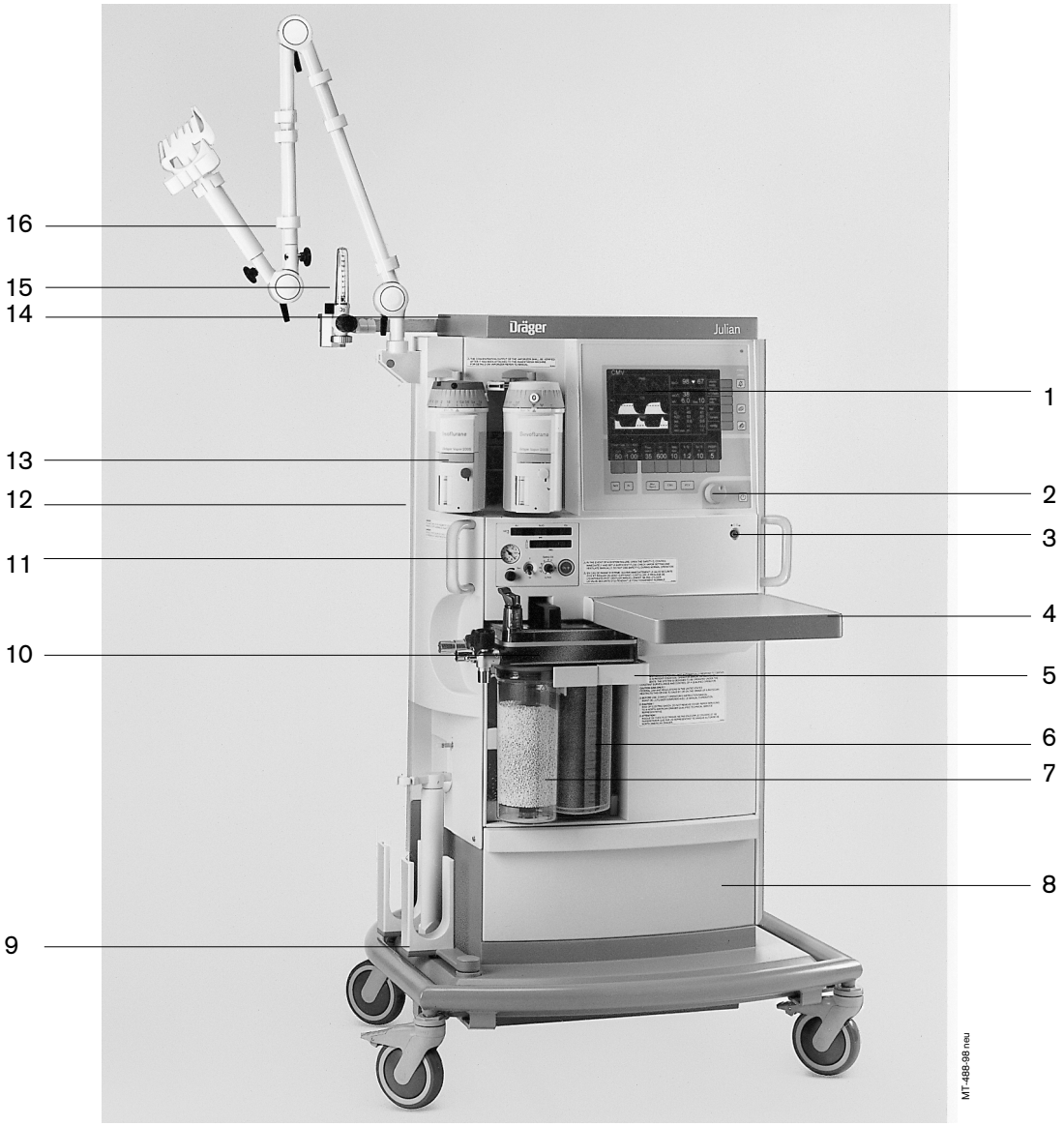
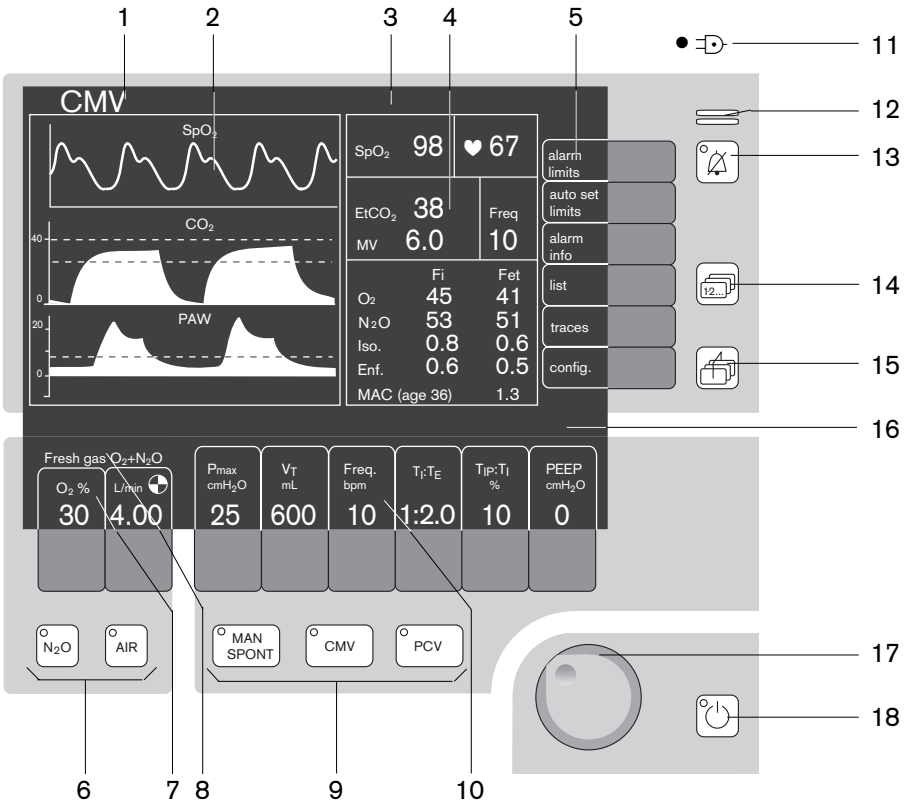


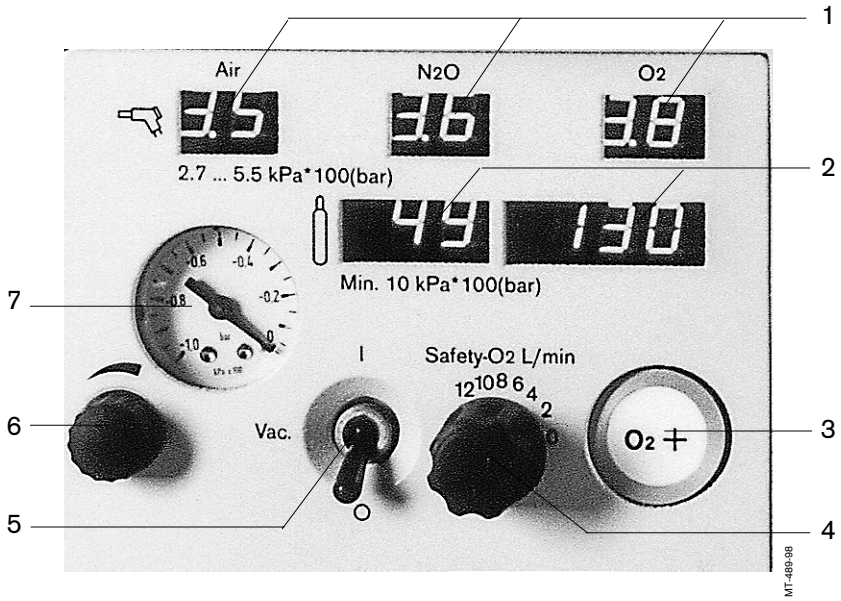
Front View

1 Screen with user interface
2 Dial knob for selecting, setting, and confirming
3 Main power switch
4 Writing top
5 Catch to unlock breathing system
6 Bellows
7 Absorber
8 Drawer
9 Holder for suction system
10 Compact breathing system
11 Front panel for gas supplies, see page 130
12 Mounting rail for accessories
13 Vapors with interlock system
14 Shelf for accessories
15 Auxiliary O_2 outlet
16 Hinged arm



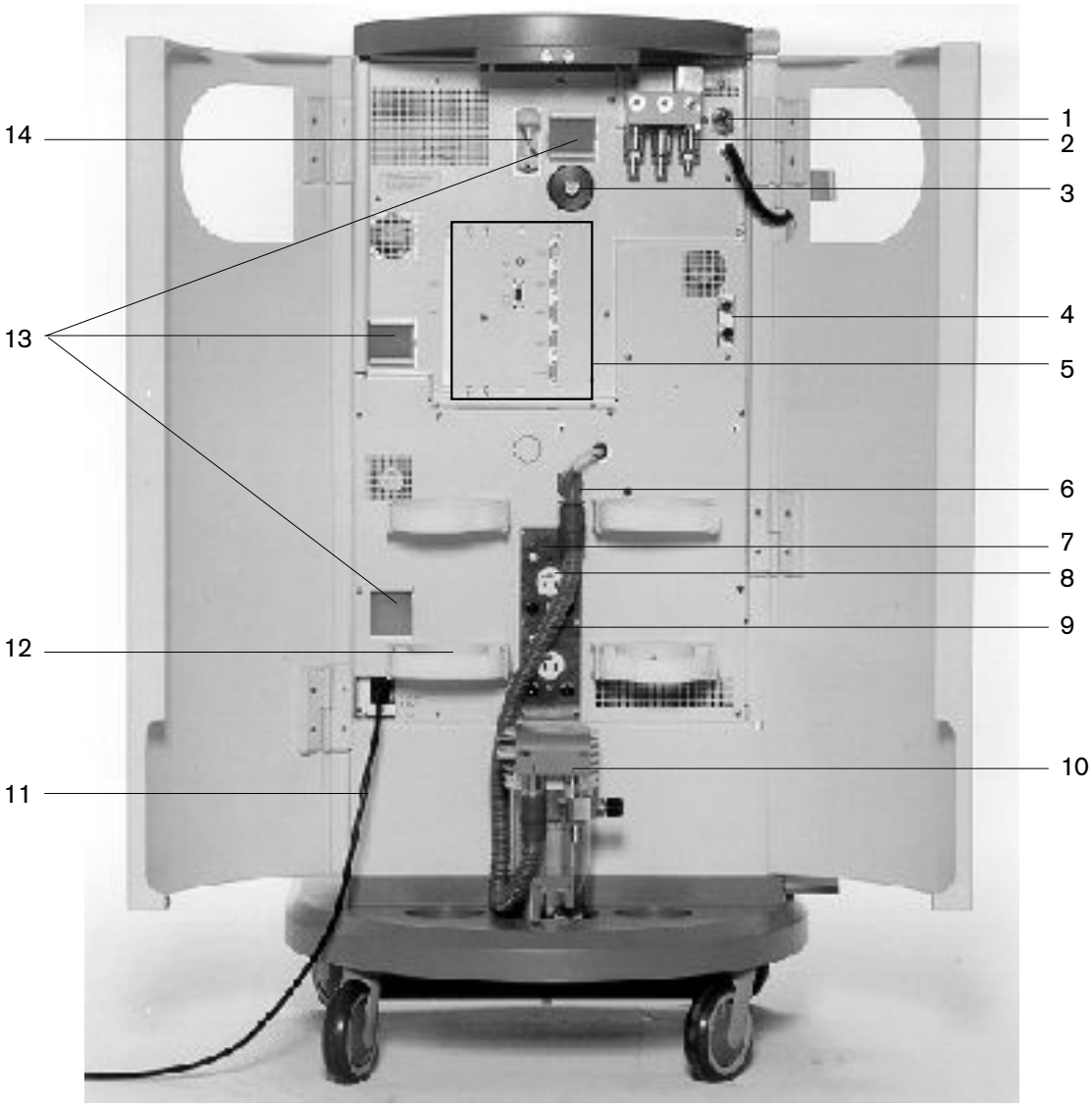
Screen with User Interface

1 Status field showing the current ventilation mode
2 Graphic field for traces and bar graphs
3 Alarm field for alarm messages and their priority
4 Measurement field for numerical values
5 Menu keys for monitoring functions
6 Keys for selecting the carrier gas (N_2O or AIR)
7 Menu keys for setting fresh gas flow
8 Status line for fresh gas
9 Keys for selecting ventilation mode
10 Menu keys for setting ventilation
11 Power supply indicator
12 Alarm indication LEDs
13 Key for suppressing audible alarm for 2 minutes
14 Key for changing monitoring screen pages
15 Key for calling up the standard screen
16 User advisory field
17 Dial knob for selection, setting and confirmation
18 Key for switching to standby mode



Gas Supply Monitoring Panel

1 Pipeline pressue display
2 Cylinder pressure display
3 O_2 flush
4 Safety O_2 flow control
5 On/Off switch for suction system
6 Vacuum pressue adjustment valve
7 Vacuum pressure gauge for suction



Rear View

1 Vacuum supply port

2 Gas supply ports

3 O_2 sensor (behind the screw-mount sensor holder)

4 Connectors for cylinder pressure sensors

5 Interface panel, see page 132

6 Waste gas connector

7 Pin for earth cable

8 Auxiliary power outlets

9 Transfer hose to anesthetic gas scavenging system AGS

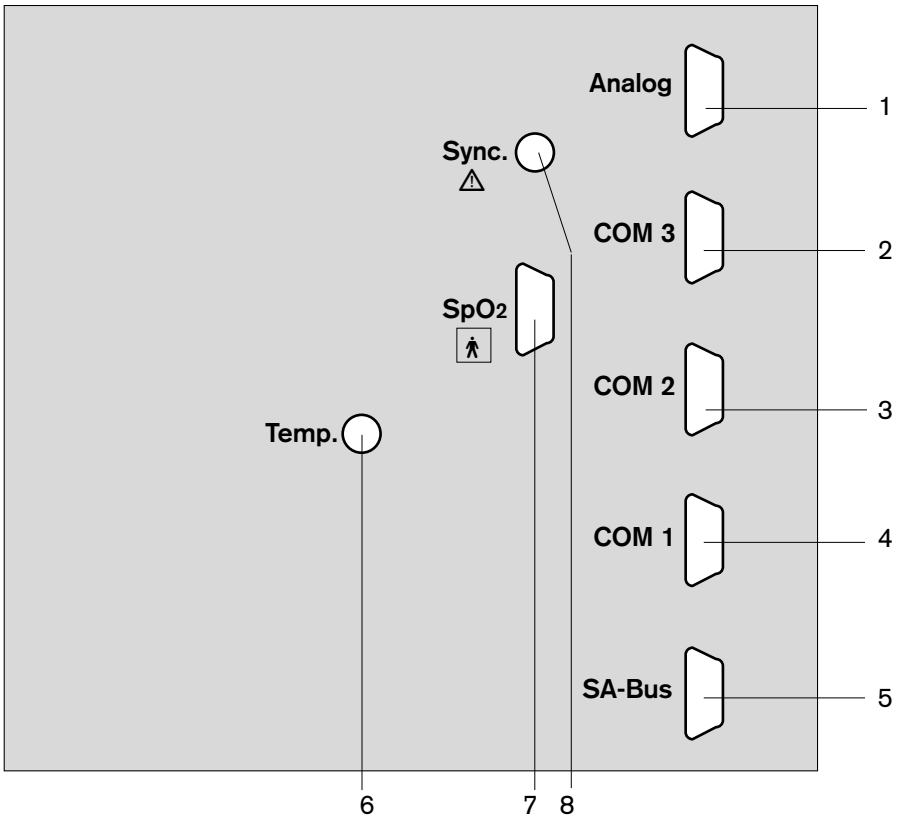
10 Anesthetic gas scavenging system AGS, see page 133

11 Power cable

12 Cylinder holders

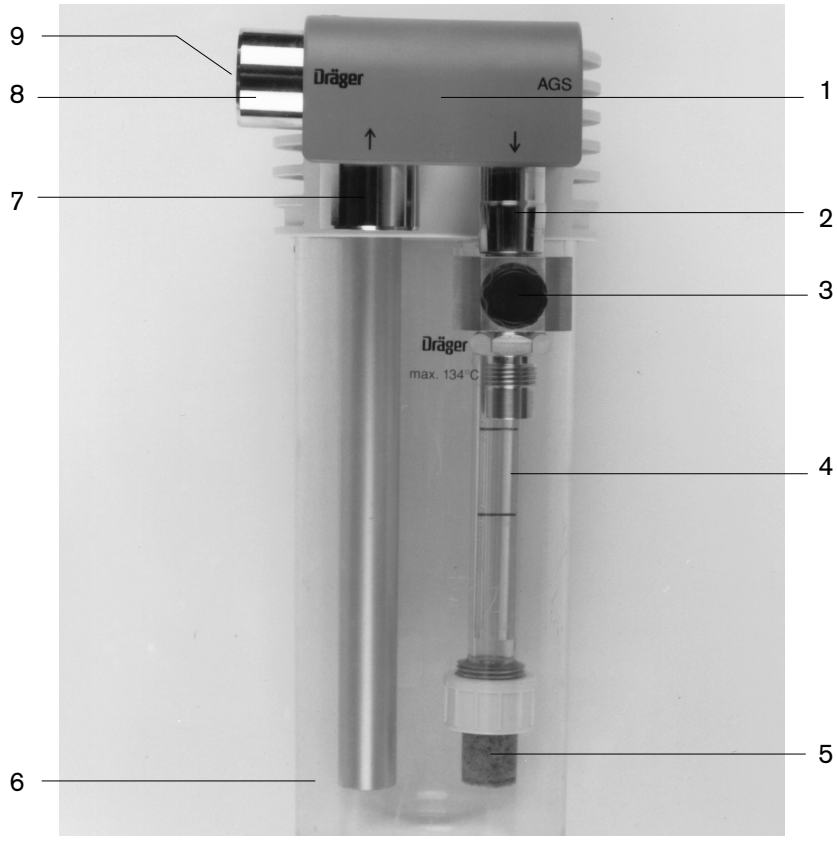
13 Cooling air filters

14 Connection for sample line and water trap



Interface Panel

1	Analog	Analog output for three waveforms
2	COM3	RS232 interface for MEDIBUS
3	COM2	RS232 interface for MEDIBUS
4	COM1	RS232 interface for printer
5	SA-Bus	For DrägerService only
6	Temp	Socket for temperature sensor, optional
7	SpO_2	Socket for SpO_2 sensor, optional
8	Sync	Socket for C-Lock-ECG synchronization of the SpO_2 option



Anesthetic Gas Scavenging System (AGS)

1 Receiving system head

2 Socket for Gas-Disposal-Assembly tubing

3 Flow adjustment valve

4 Flow indicator with float showing scavenging flow

5 Particulate filter

6 Buffer container

7 Socket for transfer hose

8 Socket for second transfer hose, closed with screw cap

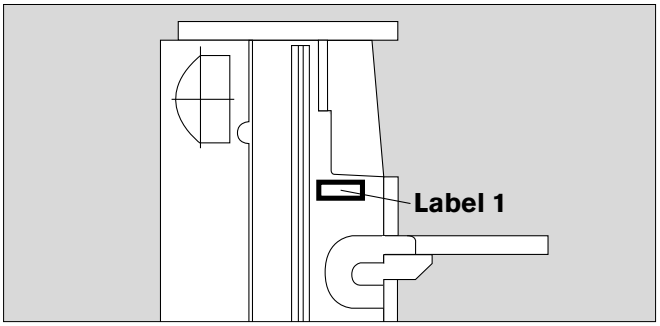
9 Socket for sample gas scavenging hose

Labels

Label 1

DANGER !
POSSIBLE EXPLOSION HAZARD IF USED IN THE PRESENCE OF FLAMMABLE ANESTHETICS.

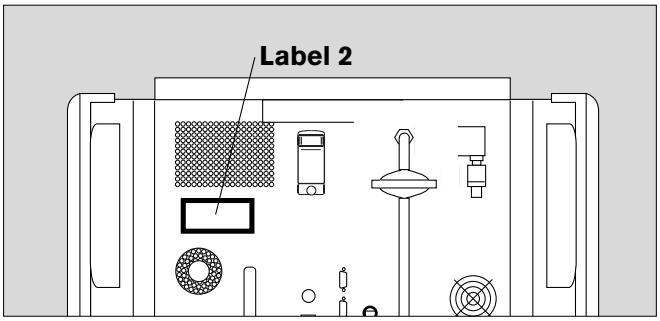
DANGER !
RISQUE D'EXPLOSION EN CAS D'UTILISATION EN PRÉSENCE D'ANESTHESIONES INFLAMMABLES.



Label 2

CAUTION !
DO NOT BLOCK AIR INTAKES.

ATTENTION !
NE PAS OBSTRUER LES ENTRÉES D'AIR.



Label 3

CAUTION !
POSSIBLE TIP OVER HAZARD. REMOVE EQUIPMENT FROM SHELF BEFORE MOVING ANESTHESIA MACHINE.

ATTENTION !
RISQUE DE BASCULEMENT. ENLEVER L'APPAREIL DE LA TABLETTE AVANT DÉPLACER LA MACHINE.

Label 4

⚠ MAX. 1.5 KG

Label 5

THIS ANESTHESIA SYSTEM WILL NOT AUTOMATICALLY RESPOND TO CERTAIN CHANGES IN PATIENT CONDITION, OPERATOR ERROR, OR FAILURE OF COMPONENTS. THE SYSTEM IS DESIGNED TO BE OPERATED UNDER THE CONSTANT SURVEILLANCE AND CONTROL OF A QUALIFIED OPERATOR.

CAUTION (USA only) !
FEDERAL LAW AND REGULATIONS IN THE UNITED STATES. RESTRICTS THIS DEVICE TO SALE BY, OR ON THE ORDER OF A PHYSICIAN.

⚠ BEFORE USE, CONSULT OPERATOR'S INSTRUCTION MANUAL. AVANT DE L'UTILISER, CONFERER AVEC LE MANUAL D'OPERATION.

⚠ **CAUTION !**
RISK OF ELECTRIC SHOCK, DO NOT REMOVE COVER. REFER SERVICING TO A DRÄGER MEDICAL, INC. QUALIFIED TECHNICAL SERVICE REPRESENTATIVE

⚠ **ATTENTION !**
RISQUE DE CHOC ÉLECTRIQUE. NE PAS ENLEVER LE COUVERCLE. NE FAIRE REPARER QUE PAR UN REPRÉSENTANT TECHNIQUE AUTORISÉ DE DRÄGER MEDICAL, INC.

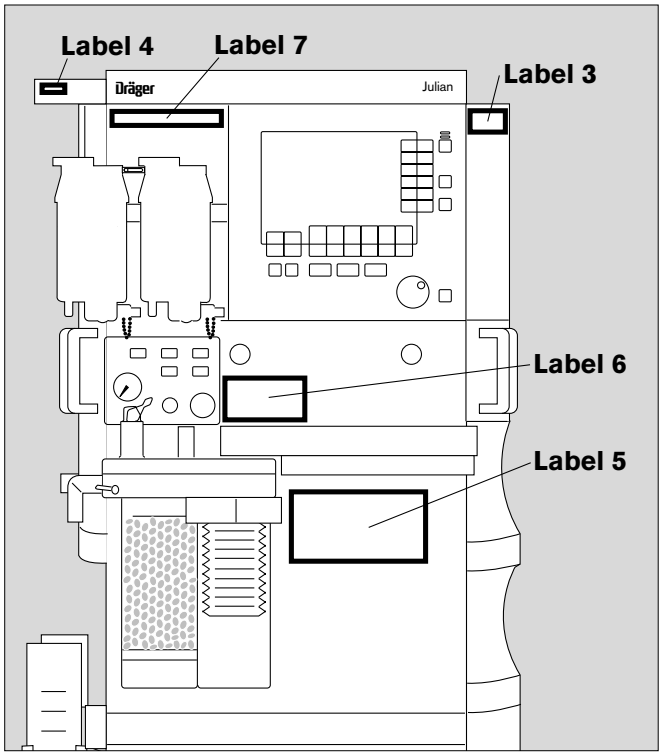
Label 6

⚠ IN THE EVENT OF A SYSTEM FAILURE, OPEN THE SAFETY O2 CONTROL IMMEDIATELY AND SET A SUFFICIENT FLOW, CHECK VAPOR SETTING AND VENTILATE MANUALLY. DO NOT USE SAFETY O2 DURING NORMAL OPERATION.

⚠ EN CAS DE PANNE SYSTEME, OUVRIR IMMEDIATEMENT LA VALVE SECURITE D'O2 ET REGLER UN DEBIT SUFFISANT. CONTROLLER LE REGLAGE DE L'EVAPORATEUR ET VENTILER MANUELLEMENT. NE PAS UTILISER LA VALVE SECURITE D'O2 PENDANT LE FONCTIONNEMENT NORMALE.

Label 7

⚠ THE CONCENTRATION OUTPUT OF THE VAPORIZER SHALL BE VERIFIED AFTER IT HAS BEEN ATTACHED TO THE ANESTHESIA MACHINE. FOR DETAILS ON VAPORIZER, REFER TO MANUAL.



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Technical Data

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Note: Specifications are given conforming to ISO 5369.

Environmental Conditions

In operation:	
Temperature	10 to 35 °C (50 to 95 °F)
Air pressure	700 to 1060 hPa
Rel. humidity	20 to 80 % (no condensation)
CO_2 concentration of ambient air	300 to 800 ppm
In storage:	
Temperature	–20 to 60 °C (-4 to 140 °F) O_2 sensor max. 50 °C (122 °F)
Air pressure	500 to 1100 hPa
Rel. humidity	<98 % (no condensation)

Performance Data

Fresh gas
(electronic mixer)

Settings:	O_2 concentration 25 to 100 vol% ±5 % of setting, at least 25 vol% or 250 mL/min
Fresh gas flow	0 and 0.5 to 12 L/min ±10 % of setting (at 101,3 kPa atmospheric pressure)
O_2 flush	>35 L/min

Ventilator
(electronically controlled, pneumatically driven bellows in bottle ventilator)

Settings:

Pressure limit Pmax	
for CMV	10 to 70 cmH_2O
for PCV	(PEEP+1) to 70 cmH_2O ±10 % of setting or at least ±2 cmH_2O
Tidal volume	
for IPPV	50 to 1400 mL ± 15% of the setting for inspiration flows ≥ 10 L/min.
for PCV	20 to 1400 mL (result of the ventilation settings)
Ventilation frequency	6 to 60 per minute, ±10 % or ±1 per minute, the smaller value applies.
Insp/Exp. time ratio T_I : T_E	1:4 to 2:1 ±10 % of setting
Plateau time ratio T_{IP} : T_I	0 to 50 % ±10 % of setting
Inspiratory flow (PCV)	5 to 50 L/min ±10 % Can be set to up to 75 L/min by DrägerService NOTE: Depending on the scavenging flow and on the actual ventilator settings, the open reservoir scavenging system can overflow when setting a high inspiratory flow.
Inspiratory flow (CMV) (cannot be set directly; depends on settings for V_T, Freq. T_I:T_E and T_{IP}:T_I)	3 to 75 L/min
PEEP	0 to 20 cmH_2O, ±10 % of setting or at least ±2 cmH_2O

Breathing system

Total gas volume (without breathing hoses)	Approx. 4.5 L enclosed gas volume
Compliance with filled absorber container, without breathing hoses	Approx. 4.5 mL/mbar
Absorber volume	1.5 L
Leakage (EN 740)	<150 mL at 30 mbar
Pressure limiting valve APL	
Adjustment range	5 to 70 mbar ±15 % of setting
Exp. resistance (EN 740)	4,8 mbar at 60 L/min
Insp. resistance (EN 740)	4,6 mbar at 60 L/min

absorber container filled with DrägerSorb 800 Plus

Measuring Functions

Pressure measurement
(piezoresistive)

Airway pressure	–10 to 99 cmH_2O
Resolution	1 cmH_2O
Accuracy	Better than ±4 % of measured value or at least 1 cmH_2O, the larger value applies)

O_2 measurement
(fuel cell in sidestream)

Sample rate	60 mL/min or 200 mL/min
Delay time for sampling	Less than 1 second
Measuring range	5 to 100 vol%
Resolution	1 vol%
Accuracy	Calibration in air: ±3 vol% in the range from 5 to 50 vol% ±5 vol% in the range from 50 to 100 vol% Calibration with 100 % O_2: ±3 vol% in the range from 5 to 100 vol%
Drift	Within the ranges specified above
Response time $t_{10...90}$	
at 200 mL/min	500 ms
at 60 mL/min	1 s

Flow measurement
(hot wire anemometry)

Tidal volume VT	
Range	0.02 to 9.99 L
Resolution	0.01 L
Accuracy (under calibration conditions and 1013 hPa)	Better than ±8 % of the measured value or 0.01 L, the larger value applies
Minute volume MV	
Range	0 to 99.9 L/min
Resolution	0.1 L/min
Accuracy (under calibration conditions and BTPS*)	Better than ±8 % of the measured value
Respiration rate	
Range	0 to 60 per minute
Resolution	±1 per minute
Accuracy	±1 per minute or ±10 %, the smaller value applies.

Breathing gas temperature measurement
(NTC resistance)

Measuring range	20 to 50 °C (68 to 122 °F)
Resolution	1 K
Accuracy	±0.5 K in the range from 30 to 41 °C (86 to 106 °F)

CO_2 measurement
(infrared spectrometry)

CO_2 measurement
(infrared spectrometry)

Sample rate (selectable)	60 mL/min or 200 mL/min
Delay time for sampling	Less than 1 s (for a sample rate of 200 mL/min)
Response time $t_{10...90}$	
at 200 mL/min	300 ms
at 60 mL/min	1 s
Measuring range	0 to 9.9 kPa (0 to 80 mmHg)
Resolution	0.1 kPa
Accuracy	±0.2 vol% or 5 % of measured value

* BTPS: Body temperature, current atmospheric pressure, gas saturated

Anesthetic gas measurement (infrared spectrometry)	**All data in % by volume at 1013 mbar current atmospheric pressure**
Sample rate (selectable)	60 mL/min or 200 mL/min
Delay time for sampling	Less than 1 s (for a sample rate of 200 mL/min)
Response time t 10...90	
at 200 mL/min	300 ms
at 60 mL/min	1 s
Accuracy	The measurement accuracy required by DIN ISO 11196 is attained at the latest 4 minutes after switching on the apparatus. The threshold for automatic detection is 0.15% by volume. To check the complete accuracy of Julian, a temperature stabilisation time of 1 hour at 21°C should be observed. The accuracy of the measuring equipment used should be at least 5 times and if possible 10 times higher than that of Julian.
Display range for N_2O	0 to 100 vol%
Resolution	0.1 vol%
Accuracy	Better than ±2 vol% absolute or ±3 % of measured value
Display range for halothane	0 to 8.5 vol%
Resolution	0.1 vol%
Accuracy for	
0 to 4 vol%	0.15 vol% or 5 % of measured value
>4 to 8.5 vol%	±10 % of measured value
Display range for isoflurane	0 to 8.5 vol%
Resolution	0.1 vol%
Accuracy for	
0 to 5 vol%	0.15 vol% or 5 % of measured value
>5 to 8.5 vol%	±10 % of measured value
Display range for enflurane	0 to 9.9 vol%
Resolution	0.1 vol%
Accuracy for	
0 to 54 vol%	0.15 vol% or 5 % of measured value
>4 to 9.9 vol%	±10 % of measured value
Display range for sevoflurane	0 to 9.9 vol%
Resolution	0.1 vol%
Accuracy for	
0 to 6 vol%	0.15 vol% or 5 % of measured value
>6 to 9.9 vol%	±10 % of measured value
Display range for desflurane	0 to 22 vol%
Resolution	0.1 vol%
Accuracy for	
0 to 15 vol%	0.15 vol% or 5 % of measured value
>8 to 22 vol%	±10 % of measured value
Automatic anesthetic gas identification	Volatile anesthetic agents are automatically identified. Manual selection is not necessary and not possible. In the case of a mixture of two volatile anesthetic agents, the concentration of the secondary anesthetic agent is displayed from a MAC value of 0.1 MAC. A secondary anesthetic agent becomes the main anesthetic agent if its MAC value exceeds the MAC value of the main anesthetic agent by 0.2 MAC. If a mixture of more than 2 volatile anesthetic agents is present, the display is blank.
Cross-sensitivity	None with respect to alcohol, acetone, methane, NO and CO.

SpO_2 measurement, optional
(light absorption)

Display range	0 to 100 % SpO_2
Accuracy (adults)	
between 70 and 100 % SpO_2	Better than ±2 % SpO_2
between 50 and 70 % SpO_2	Better than ±3 % SpO_2
between 0 and 50 % SpO_2	Not specified
Accuracy (neonates)	
between 70 and 95 % SpO_2	Better than ±3 % SpO_2
between 0 and 70 % SpO_2	Not specified
between 95 and 100 % SpO_2	Not specified
Trigger point	Once per heartbeat
Pulse rate	20 to 250 per minute
Accuracy	±2 per minute
Sensors	
Type	Compatible with Nellcor sensors Oxisensor, Oxiband and Durasensor
Wavelengths	660 nm (red) 920 nm (infrared)
Acoustic pulse signal	A tone is produced for each detected pulse, tone pitch proportional to oxygen saturation.

Interfaces

Analog output

Plug connector	9-pin sub-D, electrical isolation 1.5 kV
PAW	0 to 100 cmH_2O; 0 to 5 V =; PIN 3
Flow	0 to 150 L/min; 0 to 5 V=; PIN 6
CO_2	0 to 10 kPa; 0 to 5 V=; PIN 9
Ground	PIN 1, 4, 7

COM1 record (printer)

Connector	9-pin sub-D, electrical isolation 1.5 kV
Pin assignment	1 shield 2 TxD 3 RxD 5 GND

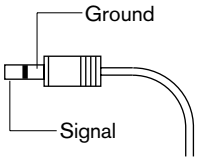
COM2 (MEDIBUS 1)

Connector	9-pin sub-D, electrical isolation 1.5 kV
Pin assignment	1 shield 2 TxD 3 RxD 5 GND

COM3 (MEDIBUS 2)

Connector	9-pin sub-D, electrical isolation 1.5 kV
Pin assignment	1 shield 2 TxD 3 RxD 5 GND

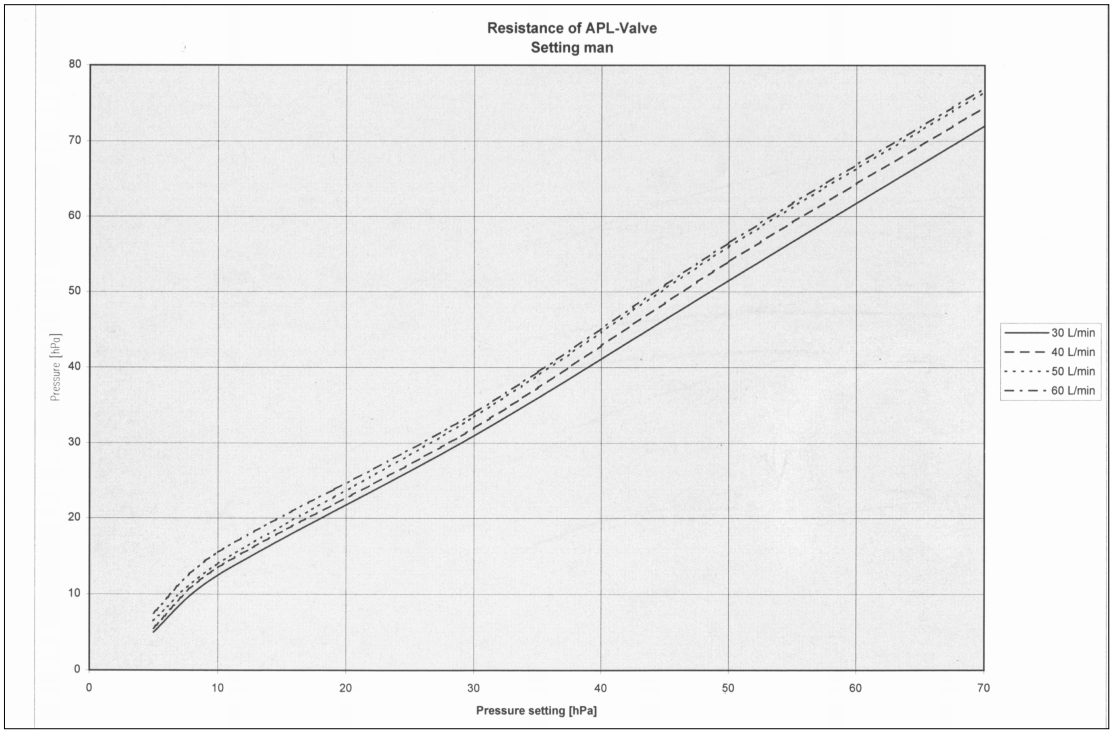
C-Lock-ECG synchronization (optional)

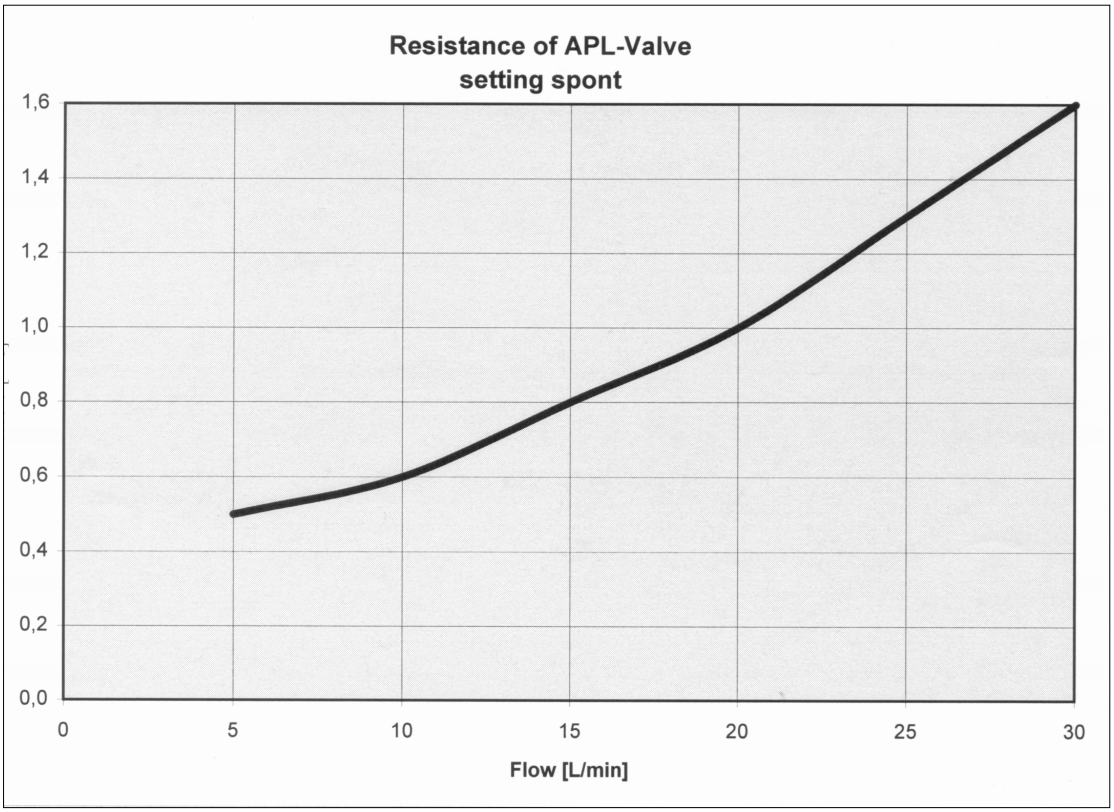
Requirements for ECG synchronization signal	Pos. pulse with voltage >4.5 V, >10 ms duration for driving 2 mA
Max. permissible signal delay with reference to current QRS complex	40 ms
Socket for 2-pin jack-plug, dia. 3.5 mm	
Jack layout	
Signal isolation from other electronic components	
Dielectric strength	4 kV

Operating Data

Operating voltage	90 – 265 V, 45 - 65 Hz
Power input	400 W typically, max. 2.3 kW
Uninterruptible power supply	With fully charged battery: at least 30 minutes (auxiliary outlets are not powered!)
Line power fuse	Automatic circuit-breaker 16 A
Auxiliary outlets	Each with two fuses 2 A DIN 41622 110/120 V AC
Medical gas supply	
O_2	270 to 550 kPa (39 to 80 psi)
N_2O	270 to 550 kPa (39 to 80 psi)
AIR	270 to 550 kPa (39 to 80 psi)
Max. cylinder pressure (O_2 and N_2O)	19,000 kPa (2,750 psi)
Drive gas consumption	
Operation	MV ±1 L/min AIR or O_2
Standby and MAN/SPONT	0 L/min
Dimensions of Julian W x H x D	68 cm x 133 cm x 68 cm
Dimensions of the storage tray W x D	43 cm x 29 cm
Dimensions of the breathing system W x H x D	31 cm x 35 cm x 21 cm
Weight (ready for operation without Vapor units and gas cylinders)	Approx. 90 kg (200 lbs)
Weight of breathing system without soda lime	4.8 kg
Screen	Electro-luminescent screen, 10.4" diagonal
Protection class	
Device	I, type B conforming to IEC 60601-1
SpO_2 sensor	Type BF electrically isolated from protective earth
Electromagnetic compatibility EMC	Tested to IEC 60601-1-2

APL Valve Characteristics





Materials Used

Part	Appearance	Material
flow sensor element with hot wire	yellow, transparent pewter	Polysulphone Platinum
Hose connectors	metallic, silver	Brass CuZn37 F45, chromium plated
Valve plate	gray	Aluminium AlMg3 G24, anodized
Valve plate seals	blue	Silicone rubber
Insp/exp. valve disks (diaphragm)	white	Rubalit 708 ceramic 708.2
Breathing system cover	yellow, transparent	Polyphenylsulfone PPSO
Absorber container	yellow, transparent	Polysulfone PSO
Absorber insert	black metallic, silver	Polyetheretherketone PEEK Brass CuZn37 F45, chromium plated
Bellows container	yellow, transparent	Polysulfone PSO
Bellows	black	Synthetic rubber

NOTE: All parts in contact with the patient's breathing gas are latex-free.

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These Operating Instructions apply only to **Julian Anesthesia Workstation** with serial no.:

Without entry of a serial no. by Dräger these Operating Instructions are provided for general information only and are not intended for use with a specific device.

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